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Measuring the Value of the U.S. Food System: Revisions to the Food Expenditure Series

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Abstract

The Food Expenditure Series tracks annual and monthly trends in the U.S. food system since 1869. Produced by USDA's Economic Research Service (ERS), the Food Expenditure Series quantifies the value of food acquisitions in the United States by type of sales outlet (e.g., grocery stores, warehouse clubs and supercenters, restaurants, recreational facilities, and so on) and product (e.g., packaged products meant for off-premises consumption, and meals and snacks meant for on-premises consumption). These data complement other USDA, ERS datasets that are used to gauge and track developments in consumer food-purchasing behaviors and the food supply. ERS researchers recently updated the methods and data used in the Food Expenditure Series, revising estimates back to 1997. Because of the extent of the changes, the comprehensive revision establishes a break with the previously published Food Expenditure Series. The trends shown in and the magnitude of the revised Food Expenditure Series estimates are comparable to household expenditure data estimated by other Federal Government agencies.

Keywords: Food Expenditure Series, household food expenditures, food away from home (FAFH), food at home (FAH), full-service restaurants, limited-service restaurants, grocery stores, convenience stores, supercenters and warehouse clubs, monthly food expenditures

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Contents

Summary	iii
Introduction.....	1
Methodology	5
U.S. Census Sales Data	7
Nonfood Adjustment to U.S. Census Sales	9
Double-Counting Adjustment to U.S. Census Sales.....	15
Direct Seller Adjustment to U.S. Census Sales	15
Multiple-Outlet Adjustment to U.S. Census Sales	16
Noncoverage Adjustment to U.S. Census Sales	16
Taxes and Tips	20
Constant-Dollar Measures	21
Final Purchasers and Users	21
Per Capita and Shares of Food Expenditures	22
Advance, Revised, and Final Estimates	23
Monthly Estimates	24
Timetable of Data Release	25
Revisions	26
Reorganization of the Food Expenditure Series.....	26
Percentage of the Revised Food Expenditure Series Based on Census Data.....	26
Validation of the Advance Estimates	28
Comparison of Previously Published and Comprehensive Revision Estimates	30
Comparison of the Food Expenditure Series With the PCE and CE Data	37
Analysis of the Comprehensive Revision of the Food Expenditure Series.....	42
Conclusion	52
References	55
List of Acronyms	61
Appendix	62



Measuring the Value of the U.S. Food System: Revisions to the Food Expenditure Series

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What Is the Issue?

The USDA, Economic Research Service (ERS) Food Expenditure Series measures the value of the U.S. food system over time, by outlet and product type, and by final purchasers and users. It is a valuable tool for government agencies, academics, the public, and other stakeholders to gauge and track developments in consumer food acquisitions and the food supply. Since the inception of the Food Expenditure Series in 1979, its methodology and source data have remained largely unchanged. To continue to provide high-quality, objective, and timely data, ERS economists reviewed, revised, and documented the methods and source data used in the Food Expenditure Series and established a timetable for future releases of the data.

What Did the Study Find?

In the comprehensive revision of the Food Expenditure Series, expenditures by all purchasers (households, government, and businesses) between 1997 and 2014 for food at home (FAH) were revised downward by an average of \$22.4 billion (-4.2 percent); expenditures for food away from home (FAFH) were revised upward by an average of \$13.3 billion (+2.5 percent). The revised FAH and FAFH estimates and the previously published estimates mostly grew at the same rate from year to year. However, the difference in magnitude of the estimates resulted in FAFH expenditures overtaking FAH expenditures in share of total food expenditures in 2010 in the comprehensive revision. In previously published Food Expenditure Series estimates, the share of total food expenditures allocated to FAFH overtook FAH in 2014.

The revised household final-user estimates in the comprehensive revision of the Food Expenditure Series are most comparable in size and growth to the Personal Consumption Expenditures (PCE) estimated by the U.S. Department of Commerce's Bureau of Economic Analysis. Both deviate from the Consumer Expenditure (CE) estimates published by the U.S. Department of Labor's Bureau of Labor Statistics.

- Food expenditures of household final users as a share of disposable personal income based on the Food Expenditure Series and PCE declined between 1997 and 2004 and have been somewhat stable thereafter—at 10.0 percent in the Food Expenditure Series and 10.8 percent in the PCE.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

- Both the Food Expenditure Series and the PCE data show that the share of total household food expenditures spent on FAFH grew until 2007, then fell or was flat until 2011, and has grown since. The CE data show a similar pattern, albeit with different timing.

The revised Food Expenditure Series, which includes 2017, shows several notable trends in the food industry including the changing composition of where Americans purchase FAH and FAFH, and the declining share of total food expenditures allocated to FAH.

- The grocery store share of FAH expenditures declined from 71.4 to 58.4 percent between 1997 and 2017. While nominal (not adjusted for inflation) growth in grocery store sales averaged 2.4 percent per year, prices at grocery stores grew at an average of 2.2 percent each year. Hence, real grocery store sales have largely been stagnant except for 2016 and 2017, when prices declined for the first time in several decades.
- The share of FAH expenditures from warehouse clubs and supercenters increased from around 6.6 percent to 21.8 percent. Warehouse clubs and supercenters' nominal sales grew between 10.9 and 23.0 percent per year before 2007. Since 2009, nominal growth has stabilized at around 2.0 to 4.5 percent, substantially less than before 2008.
- The largest component of FAFH expenditures (with taxes and tips) consists of sales at full-service restaurants (35.3 percent on average), followed closely by sales at limited-service restaurants (33.6 percent on average).
- Nominal sales for limited- and full-service restaurants between 1997 and 2017 grew an average of about 5.5 and 5.3 percent per year, respectively, but slowed for limited-service restaurants and declined for full-service restaurants in 2009. Prices at FAFH establishments grew about 2.7 percent year to year, but nominal sales at full- and limited-service restaurants outpaced this growth, indicating an increase in the quantity of meals and snacks produced and consumed at these outlets.
- The monthly estimates of FAH and FAFH sales demonstrate seasonality, peaking in December of each year and declining in January and February.

How Was the Study Conducted?

ERS economists developed methods to improve the accuracy and timeliness of the Food Expenditure Series. The major revisions include:

1. Inclusion of new source data and methods;
2. Introduction of *advance* estimates, which are lagged 1 year and based on source data that are incomplete and subject to revision; *revised* estimates, which are lagged 2 years and based on more complete data; and *final* estimates, which are benchmarked to the 5-year Economic Census;
3. Reorganization of published tables;
4. Benchmarking of the monthly sales series to the annual series; and
5. Establishment of a timetable for data release.

The estimates in the comprehensive revision of the Food Expenditure Series were reconciled to previously published estimates and to the PCE and CE estimates to assess accuracy. In addition, the advance estimates for 2016 were compared to revised estimates for 2016 to assess estimation error from using timelier but lesser quality data.

Measuring the Value of the U.S. Food System: Revisions to the Food Expenditure Series

Introduction

Data on food prices, quantities, and expenditures at different levels of the food processing and marketing sectors are fundamental for understanding how the U.S. food system operates. Using such data, policymakers can detect potential problems in the food system and develop mechanisms to address these problems; food manufacturers and retailers can track developments in consumer food-purchasing behavior and the food supply and improve the efficiency of their operations; and the public and other stakeholders can benefit from the insight these data provide into how the U.S. food system works.

The Food Expenditure Series, produced by USDA's Economic Research Service (ERS), is a major dataset that is useful to policymakers, food manufacturers and retailers, and the public. It measures the total value of all food and beverage acquisitions by final purchasers and users—individuals and households, government, businesses, and nonprofit organizations. Developed in 1979, it tracks the evolution of the value of the U.S. food system from 1869 to the present (Manchester and King, 1979). The series presents the total value of food and beverage acquisitions in several ways to permit analysis of expenditures by (1) type of product (food and alcohol for off- and on-premises consumption); (2) outlet type (grocery stores, full-service restaurants, hotels and motels, etc.); (3) final purchasers (e.g., individuals/households, government, and businesses), and (4) individual/household final users (on a per household basis and as a share of disposable personal income (DPI)).

These data are useful for evaluating changes in food spending and the composition of the food marketing system. First, the Food Expenditure Series shows that over the past several decades, the growth in the food-away-from-home (FAFH) market has outpaced the food-at-home (FAH) market, and studies have discussed the implications of these changes for retailer and processor strategies (Stewart, 2011). For example, grocery stores increasingly compete with restaurants for a greater share of the American food dollar by expanding delis to offer more prepared items and establishing in-store restaurants (Sheehan, 2017; Dixon, 2017). Additionally, the greater share of FAFH may have implications for the nutrition and health of Americans. FAFH is higher in calories, sodium, and fat than FAH (Lin and Guthrie, 2012), and access to FAFH has been associated with obesity (Milliron et al., 2017).

Second, the Food Expenditure Series shows that the share of DPI spent on food has declined, which has implications for diet diversity, food security, and food waste. Dietary energy requirements for day-to-day survival are more readily met at higher income levels, and the budgets of the poorest are likely spent on cheaper, more starchy foods (such as rice, potatoes, and bread), leading to less nutritious, less diversified diets (Clements and Si, 2018; Chai et al., 2015). In addition, the declining share of the budget dedicated to food indicates that populations are less vulnerable to food price swings and less susceptible to food insecurity (Lele et al., 2016). Consumers in developed countries, where food is a less important share of disposable income, have weak financial incentives to minimize food waste because they have access to an abundance of inexpensive, readily available food (Hodges et al., 2011).

While the U.S. Department of Labor's Bureau of Labor Statistics (BLS) and the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) also estimate expenditures on foods and beverages, ERS's Food Expenditure Series is the most comprehensive (table 1).

Table 1

Comparison of the Food Expenditure Series with data from other statistical agencies

Data product characteristics	USDA, ERS <i>Food Expenditure Series</i>	BEA <i>Personal Consumption Expenditures (PCE)</i>	BLS <i>Consumer Expenditure (CE)</i>
Nominal/real	Nominal and real	Nominal and real	Nominal
Base data	Economic Census; U.S. Census annual surveys; data from other U.S. statistical agencies; data from trade associations	I-O Accounts (Economic Census; U.S. Census annual surveys; data from other U.S. statistical agencies; data from trade associations)	Diary portion of the Consumer Expenditure Survey
Measures of variability	No	No	Yes
Frequency	Monthly sales for FAH and FAFH lagged 3 months from reference month and year; annual food expenditures (including sales) lagged 3-6 months from reference year	Monthly PCE for FAH lagged 1 month from reference year and month; annual PCE for products listed below lagged 8 months from reference year	Annual published estimates lagged 8-9 months from reference year
Where purchased (outlets)	3-9 outlet types depending on product (see tables 3a-3d for relevant NAICS industries)	None	Two outlet types: FAH and FAFH
What purchased (products)	FAH, FAFH, AAH, AAFH, farm and nonfarm home production, food furnished to institutional and noninstitutional populations (including military)	FAH, FAFH, AAH, AAFH, farm home production, food furnished to employees (including military) ¹	For the published estimates, 21 disaggregated FAH products (e.g., beef, fresh fruits) and FAFH stores ²
Meals at schools and colleges	Measured by revenue and Federal food reimbursements	Measured by cost of goods sold	Measured by out-of-pocket spending by household
Food furnished explicitly accounted (e.g., inpatient meals at hospitals included in hospital services)	Yes (see table 3c for more details)	Mostly no, except for food furnished to employees (including military)	No
Final purchasers	Yes	No	No
Final users	Yes	Yes	Yes
Home production	Both farm and nonfarm	Only farm home production	No
Value of donations	Yes	No	No
By socioeconomic group	No	No	Yes
Business expensed meals	Yes	No	No

ERS = Economic Research Service. BEA = Bureau of Economic Analysis. BLS = Bureau of Labor Statistics. I-O = Input-Output. FAH = food at home. FAFH = food away from home. AAH = alcohol at home. AAFH = alcohol away from home. NAICS = North American Industry Classification System.

¹The PCE estimates also include many more disaggregated estimates of FAH product purchases by household final users, similar to those published in the CE (e.g., beef, fresh fruits) in the Underlying Detail Tables. However, BEA cautions that "...their quality is significantly less than that of the higher level aggregates in which they are included. Compared to these aggregates, the more detailed estimates are more likely to be either based on judgmental trends, on trends in the higher level aggregate, or on less reliable source data."

²The public-use CE data contain over 100 food products, mostly FAH products and a few FAFH products, including breakfast, lunch, dinner, and snacks. The public-use CE data also contain additional FAFH outlet information, including whether the purchase was made from a full-service restaurant, limited-service outlet, vending machine or mobile vendor, school or employee site, or caterer.

Source: USDA, ERS; U.S. Department of Commerce, BEA; U.S. Department of Labor, BLS.

The BLS publishes Consumer Expenditure (CE) estimates, which are average annual household spending estimates based on the Consumer Expenditure Survey, a sample of households that track all purchase amounts over 2 weeks. It aggregates household purchases reported by the sample into 22 food products (21 foods sold at FAH establishments and an aggregate FAFH product) and uses the sample weights to estimate average household expenditures (with measures of variability) by household structure and sociodemographic group.¹ It releases the CE estimates twice a year, 8-9 months after the reference period.

These data do not capture the total value of food acquisitions in the United States. First, the CE estimates include only foods directly purchased by U.S. households. This excludes the roughly 10 to 20 percent of foods that are purchased at restaurants by businesses. Second, the CE estimates of food and beverages exclude food acquisitions that are bundled with another service as an ancillary activity (e.g., meals served to inpatients at hospitals). Third, they include very little information about where the food and beverages are purchased except whether it is from an FAH establishment (retail store), or an FAFH establishment (foodservice). Last, the CE does not count food acquisitions from home production or through donations.

The BEA derives its Personal Consumption Expenditures (PCE) estimates from its Benchmark Input-Output Accounts, with data from the U.S. Census Bureau, other U.S. statistical agencies, and trade associations (BEA, 2016a).² Its monthly PCE estimates, which are lagged 1 month from the reference month, are only for food and beverage products purchased for off-premises consumption (i.e., FAH). Its annual PCE estimates, which are lagged about 8 months from the reference year, are for broad food product aggregates—including FAH, FAFH, alcohol at home (AAH), alcohol away from home (AAFH), farm home production, and food furnished to employees.³ The PCE estimates for foods and beverages have all of the same limitations as the CE estimates—capturing only household purchases, excluding most of the value of food acquisitions bundled as ancillary activities (with the exception of schools and colleges, and military and civilian employees), providing only limited information on where foods and beverages are purchased, and excluding the value of nonfarm, home-produced food and donations. The PCE food estimates have an additional limitation in that the value of meals sold at schools and colleges is measured by cost of goods sold. This may be problematic because serving meals and snacks at higher educational institutions is increasingly a profit-making venture for schools and/or the private contractors that run the facilities, with some of these institutions opting to raise revenue through auxiliary services such as dining halls (Mathewson,

¹The BLS also releases public-use CE Survey data, which include over 100 disaggregated foods. However, an interested user would have to go to some effort to aggregate these data into a usable series.

²The BEA also produces Input-Output (I-O) estimates, which are presented in “make tables,” which show what commodities industries produce, and “use tables,” which show how industries and final users use commodities. The I-O estimates are based on data similar to that in the Food Expenditure Series, but the construction of the accounts is substantially different and does not allow for tracking food and alcohol expenditures by outlet type. This is because the I-O convention is to measure the output of industries that buy and resell merchandise, but it does not provide any additional fabrication as sales receipts less the cost of goods sold, or margin (Horowitz and Planting, 2009). Hence, the “make tables” and “use tables” only show the margin produced by food and beverage, general merchandise, and other stores, whereas the Food Expenditure Series shows total sales (with some adjustments to account for double counting).

³The PCE estimates also include many more disaggregated estimates of FAH product purchases by household final user, similar to that published in the CE (e.g., beef, fresh fruits), in the Underlying Detail Tables. However, the BEA cautions that “...their quality is significantly less than that of the higher level aggregates in which they are included. Compared to these aggregates, the more detailed estimates are more likely to be either based on judgmental trends, on trends in the higher level aggregate, or on less reliable source data.”

2017). Hence, measuring the value of meals sold at schools and colleges by food costs rather than food revenues will undervalue food expenditures.

The ERS Food Expenditure Series overcomes several of the limitations of the other data for tracking the value of food acquisitions in the U.S. food system. In doing so, it complements food expenditure data produced by the other statistical agencies. First, it captures food acquisitions by all final purchasers and not just households, and it makes adjustments to capture food produced at home, food furnished as an ancillary activity, and government donation programs, which are not food purchases. Second, it explicitly accounts for industries that sell food to generate revenue as a primary activity, such as grocery stores and restaurants, and industries where food is a supplemental activity of operations, such as in educational institutions, hospitals, and transit facilities. Third, it disaggregates food expenditures annually by outlet type. Fourth, it includes estimates of both final users and final purchasers, a distinction that is important when considering food assistance programs and other government-sponsored food expenditures. And, finally, it measures higher education meals and snacks using a revenue-based approach rather than by cost of goods sold.

This report documents the changes in methods and data used in the comprehensive revision of the Food Expenditure Series. The comprehensive revision goes back to 1997, when the U.S. Census Bureau's quinquennial (every 5 years) Economic Census—one of the major sources of data for the Food Expenditure Series—began using the North American Industry Classification System (NAICS). (Because some of the components of the revised Food Expenditure Series are measured differently or use different source data, there is a break between the previously published and the revised estimates. These differences are noted in this report.) This report also analyzes trends in the comprehensive revision of the Food Expenditure Series and compares it with BLS's CE and BEA's PCE. Finally, it discusses potential extensions to the series and limitations in using the data.

Methodology

Food expenditures can be measured three ways, with variations in each approach: (1) by retail sales, (2) by commodity flow (or value added), and (3) by the quantities at retail prices (Manchester, 1987). The retail sales approach provides the most direct measure of total purchases by final users. Consistent with the previously published Food Expenditure Series, this comprehensive revision uses the retail sales approach to measure most expenditures (fig. 1). The gray areas in figure 1 represent food and alcohol expenditures using the retail sales measurement approach.

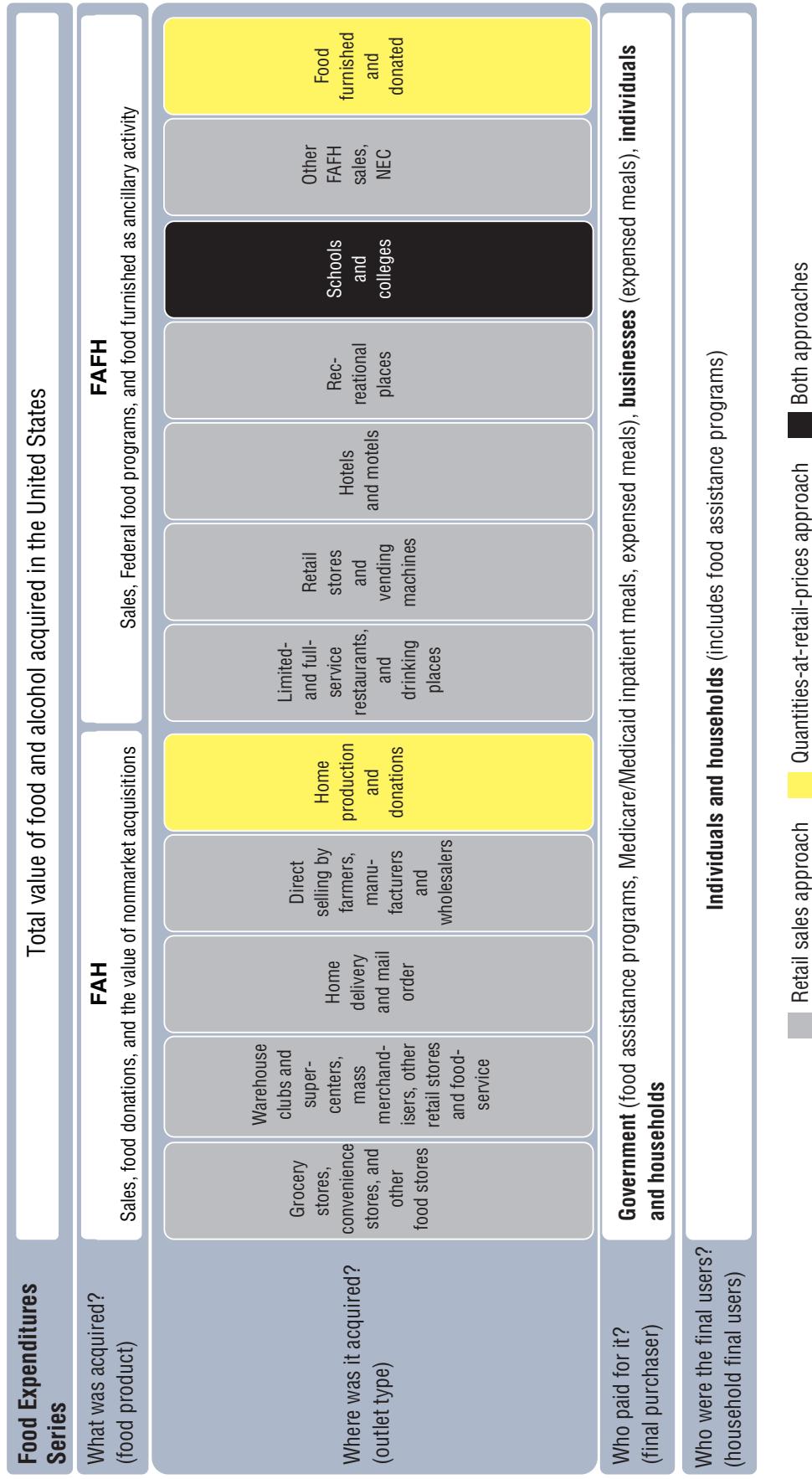
The commodity flow method starts with the value of food products farmed, fished, or imported and adds margins for each successive stage: processing, wholesaling, and retailing and foodservice. This provides the values of commodity groups that cannot be measured by the sales method. The BEA's PCE estimates are largely based on the commodity flow method (BEA, 2016a). This method is not used in the Food Expenditure Series.

The quantities-at-retail-prices approach stems from the identity that price times quantity equals expenditure. Quantities of individual foods are valued at average retail selling prices, and the total value is determined. A few components of the Food Expenditure Series are measured using this approach (mainly food furnished as part of secondary activities). The yellow areas in figure 1 represent food and alcohol expenditures estimated using the quantities-at-retail-prices approach. For many food acquisitions included in the Food Expenditure Series, accurate information on price (in levels, not indices) and quantity is less readily available from public sources than sales data, making the retail sales approach the Food Expenditure Series' preferred method of measurement. Where sales data are unavailable, the quantities-at-retail-prices approach is used.

The Food Expenditure Series uses the retail sales and quantities-at-retail-prices approaches to estimate FAFH, FAH, AAH, and AAFH sales for many industries in the retail, service, manufacturing, and wholesale sectors. It augments the industry-product sales estimates with sales taxes and tips (if applicable). It then aggregates industry-product sales into several outlet types, depending on the product. For FAH products, the outlet types are:

1. grocery stores;
2. convenience stores;
3. other food stores;
4. mass merchandisers;
5. warehouse clubs and supercenters;
6. other retail stores and foodservice;
7. home delivery and mail order;
8. direct selling by farmers, manufacturers, and wholesalers; and
9. home production and donations.

Figure 1
Composition of the Food Expenditure Series



FAH = food at home. FAFH = food away from home. NEC = not elsewhere classified.

Note: The outlet composition of AAH and AAFH products differ from those shown for FAH and FAFH in the diagram. AAH outlets are food stores; liquor stores; and other AAH, NEC. AAFH outlets are eating and drinking places; hotels and motels; and other AAFH, NEC.

Source: USDA, Economic Research Service.

The outlet types for FAFH are:

1. full-service restaurants;
2. limited-service restaurants;
3. drinking places;
4. retail stores and vending machines;
5. hotels and motels;
6. recreational places;
7. schools and colleges;
8. other FAFH sales, not elsewhere classified (NEC) (includes food sold on trains, at hospital and nursing home cafeterias, at veterans canteens, and at office buildings); and
9. food furnished as an ancillary activity (including food provided to prison inmates, inpatients at hospitals and nursing homes, military and civilian employees, and passengers on planes) and donated.

AAH outlets are food stores; liquor stores; and other AAH, NEC. AAFH outlets are eating and drinking places; hotels and motels; and other AAFH, NEC.

The Food Expenditure Series also partitions FAH and FAFH sales into final purchasers and final users. Final purchasers are those who pay for the product. For the final-purchaser estimates, food assistance and other government transfers to households are counted as government purchases.

Final users, on the other hand, are those who use the food. For the final-user estimates, food assistance and other government transfers are counted as household use. The distinction between who pays and who uses is made because government transfers are effectively income to households and are included in measures of DPI. So estimates of household food expenditures as a share of DPI, a popular measure of welfare as noted in the introduction, should include food assistance and other government transfers (Manchester, 1987). This also makes the Food Expenditure Series estimates more comparable to the CE and PCE estimates.

The primary data source for the Food Expenditure Series is the U.S. Census Bureau's annual, quarterly, monthly, and quinquennial sales data. Adjustments are made to the Census sales estimates to account for nonfood sales, double counting along the food chain, direct selling, and the value of food acquisitions not collected by the Census Bureau.

U.S. Census Sales Data

The retail sales approach starts with total annual or monthly sales for industries that sell food and alcohol. Total annual sales are reported in the U.S. Census Bureau's Annual Retail Trade Survey (ARTS), Service Annual Survey (SAS), Annual Wholesale Trade Survey (AWTS), and Annual Survey of Manufactures (ASM). Their monthly/quarterly counterparts are the Monthly Retail Trade Survey (MRTS), Quarterly Services Survey (QSS), Monthly Wholesale Trade Survey (MWTS), and Manufacturers' Shipments, Inventories, and Orders (MSIO). The Census Bureau conducts these surveys to produce national estimates of total sales and revenues for most retail, service, manufacturing, and wholesale establishments in the United States. It releases the annual surveys approximately 11 to 15 months after the reference year, and it releases the monthly/quarterly estimates 2 to 3 months after the reference month/quarter (table 2). The annual surveys include all establishment

types—those without paid employees, also known as nonemployers, and those with paid employees (U.S. Census Bureau, 2016a, b). The Census Bureau revises the monthly sales estimates every year and benchmarks them to the annual estimates, so the sum of the monthly estimates for a year equals the annual estimates (U.S. Census Bureau, 2016d).

The Census Bureau categorizes sales estimates by NAICS. The first column of tables 3a-3d shows the relevant NAICS industries used in the Food Expenditure Series for FAH, AAH, FAFH, and AAFH, and how the industries are aggregated into outlet type.

The SAS does not include estimates for most educational institutions, but the Census Bureau conducts an annual survey of public elementary and secondary school finances, the Annual Survey of School System Finances. These data contain revenues from State and local school lunches and Federal child nutrition reimbursements (U.S. Census Bureau, 2016e). Food revenues generated at private elementary and secondary schools and higher educational institutions are estimated using the quantities-at-retail-prices approach, which is discussed later.

As noted above, the Food Expenditure Series makes several adjustments to the sales reported by the Census Bureau—for nonfood sales, double counting, direct selling, multiple-outlet industries, and noncoverage industries. These adjustments are noted in separate columns in tables 3a-3d. The noncoverage adjustment is calculated using the retail sales approach and quantities-at-retail-prices approach, which is also noted. Aggregate annual FAH and AAH expenditures are calculated as the sum of sales reported in the Economic Census for the NAICS industries listed in tables 3a and 3b less the nonfood sales and double-counting adjustments, and plus the direct seller and noncoverage adjustments and sales taxes. Similarly, aggregate annual FAFH and AAFH expenditures are calculated as the sum of sales reported in the Economic Census for NAICS industries listed in tables 3c and 3d less the nonfood sales adjustment, and plus the noncoverage and multiple-outlet adjustments, sales taxes, and tips.

Table 2
U.S. Census Bureau data sources and availability

Source	Use	Lag from reference period
Monthly/quarterly surveys		
Monthly Retail Trade Survey (MRTS) (U.S. Census Bureau, 2018c)		
Monthly Wholesale Trade Survey (MWTS) (U.S. Census Bureau, 2018d)	Total sales (M, A, R, F)	2 months
Manufacturers' Shipments, Inventories, and Orders (MSIO) (U.S. Census Bureau, 2018e)		
Quarterly Services Survey (QSS) (U.S. Census Bureau, 2018f)		3 months
Annual surveys		
Annual Retail Trade Survey (ARTS) (U.S. Census Bureau, 2018g)		
Annual Wholesale Trade Survey (AWTS) (U.S. Census Bureau, 2018h)	Total sales (R, F)	15 months
Annual Survey of Manufactures (ASM) (U.S. Census Bureau, 2018i)		
Service Annual Survey (SAS) (U.S. Census Bureau, 2018j)		11 months
Annual Survey of School System Finances (U.S. Census Bureau, 2018l)	Food sales and Federal and State reimbursements (R, F)	18 months
Economic Census (U.S. Census Bureau, 2017)		
Industry Series	Nonfood adjustments (M, A, R)	3 years
Subject Series-Product Lines	Nonfood adjustments (M, A, R, F)	
Subject Series-Miscellaneous Subjects: Sales by Class of Customer	Double-counting adjustment (M, A, R, F); direct seller adjustment-manufacturing and wholesaling (M, A, R); final purchasers (A, R, F); final users (A, R, F)	4 years
Subject Series-Miscellaneous Subjects: Distribution of Contract Feeding Sales by Facility Serviced	Multiple-outlet adjustment (M, A, R, F)	4 years
Subject Series-Miscellaneous Subjects: Concession Operators	Multiple-outlet adjustment (M, A, R, F)	4 years

Note: These data are used with the retail sales approach. M = data used for the monthly estimates. A = data used for the advance estimate. R = data used for the revised estimate. F = data used for the final estimate.

Source: USDA, Economic Research Service.

Nonfood Adjustment to U.S. Census Sales

Industries often produce multiple products, and the Census Bureau's annual and monthly/quarterly surveys capture all sales from many industries for all products. For example, about 70 percent of grocery store sales (NAICS 4511) in 2012 were of packaged foods for off-premises consumption; 4 percent were of packaged liquor, wine, and beer; 2 percent were of meals and unpackaged snacks for on-premises consumption; and the remaining amount was for nonfood products. Using the Economic Census, annual and monthly/quarterly sales are adjusted to capture only food and alcohol.

Table 3a
Adjustments to Economic Census (EC) sales for FAH industries

Outlet type	NAICS industry in EC	Adjustments					Sales taxes	
		Non-food	Double counting	Direct seller	Noncoverage			
					Retail sales approach	Quantities-at-retail-prices approach		
Grocery stores	44511	X	X				X	
Convenience stores	44512	X	X				X	
Other food stores	4452	X	X				X	
Warehouse clubs and supercenters	45291	X	X				X	
Mass merchandisers	452112*	X					X	
Other retail stores and foodservice								
Motor vehicles and parts	441	X					X	
Furniture and home furnishings	442	X					X	
Electronics and appliance stores	443	X					X	
Building material and garden supplies	444	X					X	
Department stores	452111*	X					X	
Variety and catalog	45299	X					X	
Gas stations	447	X					X	
Drug and health stores	446	X					X	
Clothing stores	448	X					X	
Sporting goods, hobby, book, and music stores	451	X					X	
Miscellaneous store retailers	453	X					X	
Liquor stores	4453	X	X				X	
Full-service restaurants	7221**	X					X	
Limited-service restaurants	7222**	X					X	
Other food service (excluding food contractors)	72232, 72239	X					X	
Drinking places	7224	X					X	
Military exchanges	NA				X			
Military commissaries	NA				X			
Mail order and home delivery								
Other mail order	4541	X					X	
Vending machine operators and direct selling establishments	4542, 4543	X					X	
Direct sellers								
Direct sales to households by food wholesalers	4244***			X			X	
Direct sales to households by food manufacturers	311, 312****			X			X	
Direct sales to households by farmers	NA			X			X	
Donations and home production								
Home production: onfarm	NA					X		
Home production: off farm	NA					X		
Donations	NA					X		

FAH = food at home. NAICS = North American Industry Classification System.

Note: NA = not applicable because industry is not covered by the EC. *NAICS codes 452111 and 452112 were 4521101 and 4521102 in the 1997 EC. **NAICS code 7221 became 722511, and NAICS code 7222 became 722512, 722513, and 722514 in the 2012 EC.

NAICS code 4244 was 4224 in the 1997 EC. * Includes only NAICS industries that produce food and beverage for human consumption.

Source: USDA, Economic Research Service.

Table 3b
Adjustments to Economic Census (EC) sales for AAH industries

Outlet type	NAICS industry in EC	Adjustments					Sales taxes	
		Non-food	Double counting	Direct seller	Noncoverage			
					Retail sales approach	Quantities-at-retail-prices approach		
Food stores								
Grocery stores	44511	X	X				X	
Convenience stores	44512	X	X				X	
Other food stores	4452	X	X				X	
Liquor stores		4453	X	X			X	
Other AAH, NEC								
Motor vehicles and parts	441	X					X	
Furniture and home furnishings	442	X					X	
Gas stations	447	X					X	
Drug and health stores	446	X					X	
Clothing stores	448	X					X	
Sporting goods, hobby, book, and music stores	451	X					X	
Miscellaneous store retailers	453	X					X	
Variety and catalog	45299	X					X	
Warehouse clubs and supercenters	45291	X					X	
Mass merchandisers	452112*	X					X	
Department stores	452111*	X					X	
Other mail order	4541	X					X	
Vending machine operators and direct selling establishments	4542, 4543	X					X	
Hotels and motels	7211	X					X	
RV parks and recreational camps	7212	X					X	
Full-service restaurants	7221**, 72232	X					X	
Limited-service restaurants	7222**, 72233	X					X	
Drinking places	7224	X					X	
Caterers	72232	X					X	
Direct sales to households by food wholesalers	4244***			X			X	
Direct sales to households by food manufacturers	312****			X			X	

AAH = alcohol at home. NAICS = North American Industry Classification System.

Note: *NAICS codes 452111 and 452112 were 4521101 and 4521102 in the 1997 EC.

**NAICS code 7221 became 722511, and NAICS code 7222 became 722512, 722513, and 722514 in the 2012 EC.

***NAICS code 4244 was 4224 in the 1997 EC.

**** Includes only NAICS industries that produce beverages for human consumption.

Source: USDA, Economic Research Service.

Table 3c
Adjustments to Economic Census (EC) sales for FAFH industries

Outlet type	NAICS industry in EC	Adjustments				Sales taxes	Tips		
		Non-food	Noncoverage		Quantities-at-retail-prices approach				
			Retail sales approach	Multiple outlet					
Full-service restaurants									
Full-service restaurants	7221**	X				X	X		
Caterers	72232	X				X	X		
Limited-service restaurants									
Limited-service restaurants	7222**	X				X	X		
Mobile food vendors	72231	X				X	X		
Drinking places	7224	X				X	X		
Hotels and motels	7211	X				X	X		
Retail stores and vending machines									
Grocery stores	44511	X				X			
Convenience stores	44512	X				X			
Other food stores	4452	X				X			
Motor vehicles and parts	441	X				X			
Furniture and home furnishings	442	X				X			
Electronics and appliance stores	443	X				X			
Building material and garden supplies	444	X				X			
Department stores	452111*	X				X			
Mass merchandisers	452112*	X				X			
Warehouse clubs and supercenters	45291	X				X			
Variety and catalog	45299	X				X			
Gas stations	447	X				X			
Drug and health stores	446	X				X			
Liquor stores	4453	X				X			
Vending machine operators	4542, 72231	X				X	X		
Recreational places									
Motion pictures	51213***	X				X			
Performing arts companies	7111	X				X			
Spectator sports	7112	X				X			
Promoters of performing arts, sports, and similar	7113	X				X			
Agents/managers for artists, athletes, entertainers, and public figures	7114	X				X			
Independent artists, writers, and performers	7115	X				X			
Museums, galleries, and zoos	712	X				X			
Amusement and theme parks	7131	X				X			
Casinos	7132	X				X	X		

Continued—

Table 3c

Adjustments to Economic Census (EC) sales for FAFH industries—continued

Outlet type	NAICS industry in EC	Adjustments				Sales taxes	Tips		
		Non-food	Noncoverage		Multiple outlet				
			Retail sales approach	Quantities-at-retail-prices approach					
RV parks and recreational camps	7212	X				X			
Concessions in sports and recreation places	7221**, 7222**	X			X	X	X		
Food contracting at recreational places	72231	X			X	X			
Schools and colleges									
Public elementary and secondary schools	6111****								
Food contracting at elementary and secondary schools	72231	X				X			
Private elementary and secondary schools	NA		X						
Higher education institutions	NA			X					
All other FAFH sales, NEC									
Trains	NA		X			X			
Patriot Café, Express, and Brew	NA		X						
Hospital cafeterias	622	X					X		
Nursing home and residential care facility cafeterias	623	X					X		
Rooming and boarding houses	7213	X					X		
Religious, grant-making, civic, professional, and similar organizations	813	X							
Contract feeding at offices, government, manufacturing and industrial plants, and transit facilities	72231	X			X	X			
Food furnished and donated									
Hospital inpatients	NA			X					
Airline passengers (in-house)	NA		X						
Child daycare centers	NA			X					
Federal food programs	NA		X						
Nursing home residents	NA			X					
Adult correctional facilities	NA			X					
Youth correctional facilities	NA			X					
Other institutional group quarters	NA								
Military and civilian employees	NA		X						
Other noninstitutional group quarters	NA			X					

FAFH = food away from home. NAICS = North American Industry Classification System.

Note: NA = not applicable because not available in EC. *NAICS codes 452111 and 452112 were 4521101 and 4521102 in the 1997 EC.

**NAICS code 7221 became 722511, and NAICS code 7222 became 722512, 722513, and 722514 in the 2012 EC.

***NAICS 51213 SAS unavailable between 1997 and 2002; annual estimates are interpolated between 1997 and 2002 EC values.

****NAICS 6111 is not covered by the Economic Census, but public elementary and secondary school food revenues (including Federal and State reimbursements for school lunch programs) are covered by the Annual Survey of School System Finances collected by the U.S. Census Bureau.

Source: USDA, Economic Research Service.

Table 3d
Adjustments to Economic Census (EC) sales for AAFH industries

Outlet type	NAICS industry in EC	Adjustments				Multiple outlet	Sales taxes	Tips			
		Non-food	Noncoverage		Quantities-at-retail-prices approach						
			Retail sales approach								
Outlet type	NAICS industry in EC	Non-food	Retail sales approach		Quantities-at-retail-prices approach	Multiple outlet	Sales taxes	Tips			
Eating and drinking places											
Full-service restaurants	7221**, 72232	X				X	X	X			
Limited-service restaurants	7222**, 72233	X				X	X				
Drinking places	7224	X					X	X			
Hotels and motels	7211	X					X	X			
Other AAFH, NEC											
Grocery stores	44511	X					X				
Convenience stores	44512	X					X				
Other food stores	4452	X					X				
Variety and catalog	45299	X					X				
Gas stations	447	X					X				
Drug and health stores	446	X					X				
Liquor stores	4453	X					X				
Motion pictures	51213***	X					X				
Performing arts companies	7111	X					X				
Spectator sports	7112	X					X				
Promoters of performing arts, sports, and similar	7113	X					X				
Agents/managers for artists, athletes, entertainers, and public figures	7114	X					X				
Independent artists, writers, and performers	7115	X					X				
Museums, galleries, and zoos	712	X					X				
Amusement and theme parks	7131	X					X				
Casinos	7132	X					X	X			
Golf courses, ski resorts, marinas, fitness/recreation centers, bowling alleys, and other	7139	X					X				
RV parks and recreational camps	7212	X					X				
Concessions in sports and recreation places	7221**, 7222**	X				X	X	X			
Religious, grant-making, civic, professional, and similar organizations	813	X									

AAFH = alcohol away from home. NAICS = North American Industry Classification System.

Note: **NAICS code 7221 became 722511, and NAICS code 7222 became 722512, 722513, and 722514 in the 2012 EC.

***NAICS 51213 SAS unavailable between 1997 and 2002; annual estimates are interpolated between 1997 and 2002 EC values.

Source: USDA, Economic Research Service.

The Economic Census is a complete enumeration of all known employer establishments. Like the Census Bureau's annual, monthly, and quarterly surveys, the Economic Census classifies establishments using NAICS. For most sectors in the Economic Census, the Census Bureau sends report forms to all large, medium-sized, and multi-establishment firms (one form to be completed for each of its establishment for multi-establishment companies). For most sectors, it also mails report forms to a sample of small employers with paid employees. This sample consists of single-establishment firms with payroll below a specified cutoff. However, for most very small firms, including nonemployer establishments, the Census Bureau uses data from existing administrative records of other Federal agencies. These records provide basic information for the business, including sales, payroll, number of employees, legal form of organization, and other statistics (U.S. Census Bureau, 2016c).

For employer establishments, the Economic Census reports sales by NAICS industry and product, which allows the total sales (employer and nonemployer) reported in the annual, quarterly, and monthly surveys to be broken down into products in the Food Expenditure Series. These data are published in the Economic Census Industry Series, which are preliminary estimates, and the Subject Series-Product Lines report, which supersedes the estimates in the Industry Series. The relevant product lines are shown in appendix tables A1a-A1d for each Economic Census year for the comprehensive revision. The Economic Census data are released 3 to 4 years after the reference year. For example, the 2017 Economic Census preliminary product line estimates will be released in 2020 (Industry Series) and revised in 2021 (Subject Series). The estimates in the annual surveys are benchmarked to the Economic Census estimates, and annual survey estimates are revised back 5 years from the reference year (U.S. Census Bureau, 2016d).

Double-Counting Adjustment to U.S. Census Sales

Using the retail sales approach can result in double counting of sales in the food system. Food and liquor stores, and warehouse clubs and supercenters may sell to restaurants and other food stores, which either resell the food and alcohol as purchased at a markup or transform the food and alcohol into another edible product before selling it. Because these food and alcohol purchases will be captured in the final sales estimates for foodservice and retail stores, the Food Expenditures Series excludes sales to businesses from food and liquor store sales (NAICS 44511, 44512, 4452, and 4453) and warehouse clubs and supercenters sales (NAICS 45291). These adjustments are noted in tables 3a-3d.

The Economic Census publishes data for some industries by type of purchaser (i.e., households and individuals, businesses, government) in the Subject Series-Miscellaneous Subjects: Sales by Class of Customer report. For each NAICS industry code, the Miscellaneous Subjects Class of Customer data show the percentage of sales to final purchasers. The Food Expenditure Series uses these data to exclude sales of food and liquor by retailers to other retailers or foodservice for resale in the food system.

Direct Seller Adjustment to U.S. Census Sales

Wholesalers and manufacturers can sell their products directly to households and governments. However, most sales by food and beverage wholesalers and manufacturers are to other businesses—food stores and restaurants—and these will be captured in the sales of food stores and restaurants. The Food Expenditure Series also uses the Miscellaneous Subjects Class of Customer data to estimate direct sales of foods and alcoholic beverages to households by food and beverage wholesalers. No data are available to estimate manufacturers' direct sales of foods and alcoholic beverages to households,

but the Food Expenditure Series assumes that households purchase foods and alcoholic beverages from manufacturers at the same rate that they purchase foods and alcoholic beverages from wholesalers. In 2012, 0.3 percent of total sales was to households. This percentage is applied to annual sales reported in the AWTS and ASM, and to the monthly sales reported in the MWTS and MSIO.

Multiple-Outlet Adjustment to U.S. Census Sales

For foodservice contractors and concession operators that operate in multiple outlet types, sales must be allocated to the appropriate one. The Subject Series-Miscellaneous Subjects reports are also useful for allocating these sales. The Subject Series-Miscellaneous Subjects: Distribution of Contract Feeding Sales by Facility Serviced report shows the percentage of food contracting sales (NAICS 72231) at schools and colleges, recreational facilities, nursing homes, hospitals, office buildings, manufacturing plants, and transit terminals. The Food Expenditure Series allocates food contracting sales to FAFH for outlet-types schools and colleges; recreational places; and other FAFH sales, NEC.⁴ The Subject Series-Miscellaneous Subjects: Concession Operators report shows the percentage of limited- and full-service restaurant sales that are concessions at recreational facilities. Limited- (NAICS 72252, 72253, and 72254) and full-service (NAICS 72251) restaurants are included in the outlet-type eating and drinking places. Therefore, FAFH concession sales are reallocated from eating and drinking outlets to recreational facilities.

Noncoverage Adjustment to U.S. Census Sales

The Census Bureau does not include sales of food and beverages for several industries. For some of the industries not covered by Census, sales can be derived from an alternative, non-Census Bureau data source. In tables 3a-3d, these industries are denoted in the column “noncoverage adjustment: retail sales approach.” However, sales for several other industries are not immediately available. For these industries, data on prices and quantities are obtained from a variety of sources, and the quantities-at-retail-prices approach is used to measure sales or costs. As indicated by the yellow areas in figure 1, the quantities-at-retail-prices approach is used for parts of the Food Expenditure Series where sales data are unavailable. These industries are also denoted in tables 3a-3d in the “noncoverage adjustment: quantities-at-retail-prices approach” column.

Table 4 (upper portion) shows the source of sales data for food and alcohol sales on trains, at veterans canteens, and at military commissaries and exchanges, and for direct sales by farmers, as well as the lag length of data release. Amtrak captures revenue generated by foods sales on trains in its annual financial reports (Amtrak, 2017). The Veterans Canteen Service provides food revenues at veterans canteens (e.g., Patriot Café, Patriot Express, and Patriot Brew), and the Defense Commissary Administration and IRI InfoScan scanner data provide food revenues from the commissaries and exchanges, respectively. USDA’s Agricultural Census (USDA, 2017) and Local Food Marketing Practices Survey (USDA, 2016) provide data to estimate direct sales of commodities by farmers. Since the Agricultural Census is conducted only every 5 years, the values of direct sales are linearly interpolated for non-Census years. However, the Local Food Marketing Practices Survey provided additional insight in 2015, which was used in measuring direct sales by farmers to consumers.

⁴The food contracting sales at nursing homes, hospitals, and higher education institutions are not allocated to any outlet type because food expenditures at these outlets are measured using a quantities-at-retail-prices approach. This approach measures food expenditures as the population at each institution times the price or cost per meal. Food expenditures as measured with this approach include sales from both self-operated and contracted services.

Table 4
Non-Census data sources and availability

Non-Census data	Use	Lag from reference period
Sales and revenue		
<ul style="list-style-type: none"> Patriot Café, Brew, and Express (Veterans Canteen Service special tabulation) Commissaries (IRI InfoScan special tabulation; Defense Commissary Administration special tabulation) Exchanges (IRI InfoScan special tabulation) Trains (Amtrak, 2017) Direct sales by farmers (USDA Agricultural Census, 1997, 2002, 2007, 2012; USDA Local Food Marketing Practices Survey, 2015) 	Noncoverage adjustment (A, R, F) Noncoverage adjustment (R, F) Noncoverage adjustment (R, F) Noncoverage adjustment (A, R, F) Noncoverage adjustment (R, F)	3 months 15 months 15 months 3 months 2 years
Prices or food costs per person		
<ul style="list-style-type: none"> Average board per student at 2- and 4-year colleges (NCES, 2016) CACFP reimbursement rates (Federal Register, 2017) Average cost per meal at hospitals (Foodservice Director, 2006, 2007, 2008) Average cost per meal at long-term and senior housing (Foodservice Director, 2013, 2014, 2015) Average cost per meal at State prisons (Stephan, 1999, 2004) Average price of foods (levels) in Quarterly Food-at-Home Price Database (Todd et al., 2010) Average price of foods (rates of change) in BLS Average Price Database (BLS, 2018d) 	Meals served at higher education institutions (R, F) Meals served at child daycare centers (A, R, F) Inpatient meals at hospitals (*) Inpatient meals at nursing homes; meals at institutional and noninstitutional group quarters (*) Inmate meals (adult and juvenile) (*) Off-farm home production (*) Off-farm home production (*)	18 months 1 month NA; only available for 2004-2007 NA; only available for 2013-2015 NA; only available for 1996 and 2001 NA; only available for 1999-2010 1 month
Population		
<ul style="list-style-type: none"> 2- and 4-year college fall enrollment (NCES, 2016) Daycare population (U.S. Census Bureau, various years b; Federal Interagency Forum on Child and Family Statistics, 2016) Inpatient hospital days (AHA, 2016) Inpatient nursing home days (CDC, NCHS, various years a) Other institutional group quarters (U.S. Census, 2003; 2013; U.S. Census Bureau, various years a) Other noninstitutional group quarters (U.S. Census Bureau, 2003, 2013, various years c) 	Meals served at higher education institutions (R, F) Meals served at child daycare centers (*) Inpatient meals at hospitals (R, F) Inpatient meals at nursing homes (R, F) Meals at institutional group quarters (R, F) Meals at noninstitutional group quarters (R, F)	18 months Available for various years 18 months 3 years Every 10 years with 3-year lag; interpolated between years and use ACS to pull estimates forward Every 10 years with 3-year lag; interpolated between years and use ACS to pull estimates forward

Continued—

Table 4
Non-Census data sources and availability—continued

Non-Census data	Use	Lag from reference year
Population		
<ul style="list-style-type: none"> Youth prisons (OJJDP, 2015) Adult prisons (BJS, 2017) Percent of population consuming food produced at home and mean grams of food consumed that were produced at home (CDC, NCHS, various years b) 	Adult inmate meals (R, F) Juvenile inmate meals (R, F) Off-farm home production (R, F)	3 years; population estimates held constant for lagged years 18 months Biennial with 3-year lag
Cost of food furnished		
<ul style="list-style-type: none"> Air travel (BTS, 2017) Military and civilian employees (BEA, 2016b) 	Air travel (A, R, F) Meals provided to active military and civilian employees (A, R, F)	1 month 1 month
Other data		
<ul style="list-style-type: none"> Value of onfarm home consumption (USDA, ERS, 2016) Forecasted farm income (USDA, ERS and NASS, 2018) Federal food programs: food distributed to institutions and the elderly (FNS special tabulation; ACL, 2017) Consumer Price Index: all FAH, U.S. city average (BLS, 2018b) Consumer Price Index (CPI): food at employee sites and schools, U.S. city average (BLS, 2018b) Producer Price Index (PPI): food and beverage for immediate consumption services (BLS, 2018c) Employment for select NAICS industries (BLS, 2018a) Employment on farms (USDA, NASS, 2018) 	Onfarm home production (A, R, F) Extrapolator for noncoverage adjustment-direct sales by farmers (A) Food donations; final users and purchasers (A, R, F) Extrapolator for military commissaries/exchanges, nonfarm home production (A); interpolator for home production (*) Extrapolator for school and colleges (A) Extrapolator/interpolator for inpatient meals at hospitals and nursing homes, prison meals, and meals at noninstitutional and institutional homes (*) Interpolator for QSS, exchanges, and commissaries (M) Interpolator for noncoverage adjustment-direct sales by farmers (M)	1 month NA 1 month 1 month 1 month 1 month 1 month 5 months

CDC = Centers for Disease Control and Prevention. NCHS = National Center for Health Statistics. AHA = American Hospital Association.

BTS = Bureau of Transportation. CACFP = Child and Adult Food Care Program. FNS = USDA, Food and Nutrition Service. ACL = Administration for Community Living. BJS = Bureau of Justice Statistics. OJJDP = Office of Juvenile Justice and Delinquency Prevention. ACS = American Community Survey. BEA = Bureau of Economic Analysis. VA = Department of Veteran Affairs. BLS = Bureau of Labor Statistics. QSS = Quarterly Services Survey. NASS = USDA, National Agricultural Statistics Service. NCES = National Center for Education Statistics.

Note: M = data used for the monthly estimates. A = data for the advance estimate. R = data used for the revised estimate. F = data used for the final estimate. * = data are not continuous throughout the revision period, and a Consumer Price Index or Producer Price Index is used to interpolate and/or extrapolate the series for missing values.

Source: USDA, Economic Research Service (ERS) compilation from sources listed above.

The quantities-at-retail-prices approach is used to estimate sales or costs for: (1) private elementary and secondary education, (2) higher education, (3) food furnished as an ancillary activity, (4) home production, and (5) food donations and some Federal food programs. The middle portion of table 4 shows sources for food costs per person (prices), and the lower portion shows sources for relevant populations (quantities) that are used in the quantities-at-retail-prices approach. Table 4 also shows the availability of the data.

Food revenues generated at higher educational institutions are estimated as enrollment multiplied by national average boarding costs. The U.S. Department of Education's National Center for Education Statistics (NCES) reports total fall enrollment at 2- and 4-year colleges as well as the percentage of students who attend full and part time (NCES, 2016). It is assumed that those attending colleges full time will purchase board through the school. The number of full-time students at 2- and 4-year colleges is then multiplied by the average board price at 2- and 4-year colleges.⁵

Food furnished is food bundled with another service or activity and is measured as the cost of the food provided to individuals using that service or engaging in that activity. This includes the cost of food provided to travelers in transit (airplanes); inpatients at hospitals, nursing homes, and psychiatric hospitals; inmates at prisons; active military, civilians as part of their employment; and residents at shelters and other temporary shelters and group homes. The value of food furnished is generally estimated as the population being served times the cost of food per person. In many cases, food costs per individual are unavailable for the entire revision (e.g., cost per meal per inmate, hospital patient, nursing home resident), so linear interpolation or extrapolation using a producer price index (PPI) for food and beverage for immediate consumption services is used to impute missing values. In a few cases, food costs per individual are unavailable (e.g., for youth prisons, other institutional and noninstitutional group quarters, child daycare centers). For inmates at youth prisons, two-thirds of the estimate of food costs per adult inmate is used. Food costs per nursing home resident proxies for food costs per resident at other institutional and noninstitutional group quarters. Food costs per child at daycare centers are assumed to be at the USDA Child and Adult Care Food Program (CACFP) reimbursement rates.⁶

The Food Expenditure Series also includes the value of home production. Acquisitions of foods produced at home are measured for farmers and for nonfarmers who have a garden plot. The value of nonfarm home production is based on: (1) the proportion of the population that grows or catches food and consumes it, (2) the average weight of home-produced foods consumed by home producers, and (3) the price of the total daily pounds consumed of home-sourced food and the price per pound paid at grocery stores for similar foods. First, the proportion of the population that grows or catches their own food and the average grams of food consumed that are “grown or caught by you or someone you know” are calculated using the 2-day dietary recall data in the National Health

⁵The Economic Census reports the value of food services provided to higher education institutions by foodservice contractors. In 2012, the Economic Census reported that 24.2 percent of food contractor sales (about \$9.0 billion) were at higher education institutions. However, only 41.0 percent of colleges and universities are contract-managed (Foodservice Director, 2016); 52.0 percent are self-operated; and 7.0 percent are a combination of both. We estimate the value of food services provided at higher educational institutions using NCES data and the value of quantities-at-retail-prices approach to capture food expenditures for all food purchased at higher educational institutions, regardless of how they are operated. Using this approach, food expenditures at higher educational institutions were \$48.9 billion.

⁶The Internal Revenue Service announced on February 24, 2003, that family childcare providers may now choose to use a standard meal allowance rate to claim food deductions instead of keeping detailed records and food receipts. The new rate adopts the Tier 1 rate from the U.S. Department of Agriculture's CACFP. It is likely that this cost per child per meal is a lower bound estimate of the actual food costs of child daycare providers.

and Nutrition Examination Survey (NHANES) (CDC, NCHS, various years b).⁷ Using the sample weights to extrapolate the sample to the U.S. population and converting the consumption to a per pound basis, the daily pounds consumed of home-produced foods by food group is calculated. Then, national average retail prices for foods are calculated by pulling forward prices reported in the ERS Quarterly Food-at-Home Price Database (Todd et al., 2010) using the rate of change in prices reported in the BLS Average Price Database (BLS, 2018d). The average retail prices are assigned to food groups in the NHANES (2-digit USDA food codes) for food sourced from home production. The annual value of nonfarm home production, *Nonfarm*, in year *t* is then calculated as

$$\text{Nonfarm}_t = 365 \times \text{USpop}_t(\text{count}) \times \frac{\text{Home}_t(\text{count})}{\text{USpop}_t(\text{count})} \times \sum_i \text{Home}_{t,i}(\text{grams})|_{\text{Home}} \times p_{ti}$$

where *USpop* is the U.S. population, *Home_t*(count) is the number of individuals who consumed food produced or caught, *Home_{t,i}* is the grams of food *i* produced at home or caught, and *p* is the price. This figure is augmented by the value of food acquisitions onfarm from the ERS Farm and Income Wealth Statistics (USDA, ERS, 2016).

Last, the Food Expenditure Series includes the value of food provided by the U.S. Government to low-income individuals and households through direct donations of food or reimbursed food costs. Through the Commodity Supplemental Food Program, the Emergency Food Assistance Program (TEFAP), and the Food Distribution on Indian Reservations and Trust Program, USDA purchases a variety of nutritious, high-quality foods and makes those foods available through State distributing agencies. USDA also provides meals to low-income children through its Summer Food Service Program. The U.S. Department of Health and Human Services' Nutrition Services Incentive Program, administered by the Administration for Community Living (ACL), provides cash, USDA foods, or both to State agencies to distribute to elderly Americans. Through the CACFP program, USDA reimburses child and adult daycare centers for providing nutritious meals. The largest USDA food programs—such as the Supplemental Nutrition Assistance Program (SNAP), and the National School Lunch Program (NSLP) and School Breakfast Program (SBP)—are included in the retail food sales and the elementary and secondary school food revenue data, respectively.

Taxes and Tips

The estimates of the sales of food and beverages are augmented in two ways. First, sales taxes are applied to most sales. Second, tips are applied to FAFH at full-service restaurants, drinking places, hotels and motels, full-service concessions at recreational places, and casinos.⁸ The last columns in tables 3a-3d denote the industries in which sales taxes and/or tips are applied.

“National” sales tax rates are generated for the food products as State-level sales tax rates weighted by food and alcohol sales in each State. State-level sales tax rates are collected each year for FAH, FAFH, AAH, and AAFH products from each State’s revenue office website. The Tax Foundation (see Drenkard, 2012, 2013, 2014; Drenkard and Walczak, 2015; Drenkard and Kaeding, 2016)

⁷The National Health and Nutrition Examination Survey started collecting this information in the 2003-04 survey. Because there is little variation across surveys on the proportion of the population that consumes food grown or caught, the 2003-04 estimates are used for 1997-2002.

⁸It is assumed that most FAFH purchased at casinos is from full-service restaurants.

publishes average local sales tax rates by State, which are added to each State's sales tax rate.⁹ Food and alcohol sales by State and industry are available in the Economic Census every 5 years, and the percentage of total sales for food and alcohol by State and industry are applied to annual total sales in the ARTS and SAS. The national sales tax rate applies to sales for industries noted in tables 3a and 3b. This method is consistent with the method used until 1997; however, the sales taxes had not been updated since.

Between 1997 and 2017, average sales tax rates are the highest for alcohol, both on- and off-premises, at 7.1 percent. The sales tax rate for on-premises foods is 6.9 percent, on average, which is a 0.3-percentage-point increase compared to the previously published average sales tax rate for on-premises foods. The average sales tax rate for off-premises foods is 2.2 percent, which is an average 1.1-percentage-point more than the tax rate used in the previously published tables.

In the previous Food Expenditure Series calculations, a tip rate of 15.0 percent was applied to FAFH at full-service restaurants, drinking places, and full-service concessions at recreational facilities. However, evidence suggests that the tip rate should be higher; in 2013, Zagat (2013) found the average tip rate to be 19.0 percent. In the Food Expenditure Series revision, the tip rate increases 1 percentage point between Economic Census years starting with 15.0 percent in 1997 and ending with 18 percent in 2012. Food and alcohol sold at casinos, which was not counted in previously published Food Expenditures Series, is also tipped.

Constant-Dollar Measures

Economists are interested in tracking actual retail sales, independent of any price movements (overall economic inflation). This enables them to make sensible comparisons across time periods, even as prices move. Price fluctuations distort economic variables measured in dollar values if real values that take out price changes are not used.

Separating out the price effect gives a clearer picture of movements in sales levels relative to any time period. The object then becomes to remove any part of the variable's change that is attributable to price movements, arriving at a constant-dollar (or inflation-adjusted) indicator. This is done by dividing the nominal (nonadjusted) value by a common price index measure that represents the value of a basket of goods in a certain time period, relative to the value of the same basket in a base period.

For the Food Expenditure Series, each nominal value presented in the comprehensive revision is deflated by a Consumer Price Index (CPI)—the FAH expenditures are deflated with the CPI for FAH, the FAFH expenditures with the CPI for FAFH, the AAH expenditures with the CPI for AAH, and the AAH expenditures with the CPI for AAH.

Final Purchasers and Users

As noted in figure 1, the Food Expenditure Series allocates sales to final purchasers and final users. There are three types of final purchasers and final users—government, households, and businesses.¹⁰

⁹The Tax Foundation archived the average local sales tax rates by State only back to 2012. Between 1997 and 2011, the locality adjustment by State is calculated by averaging county-level local sales taxes collected by the Sales Tax Clearinghouse (2012) weighted by population within each county reported by the U.S. Census Bureau (various years c). This is the same method that the Tax Foundation uses to estimate the average local sales tax rates by State.

¹⁰For the final-purchaser estimates, home production is kept separate from households.

Most purchasers and users of food are households, but government and businesses also purchase food. Final purchasers are those who pay for the food, while final users are those who use the food. This difference is important mainly for food assistance programs (e.g., SNAP; USDA's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC); NSLP; and so on) and other government programs. For food that is paid for by the Federal Government, such as purchases made with SNAP and WIC benefits, the Government is considered the final purchaser, and households are considered the final users.

Estimates of government purchases of food are constructed using information on the cost of U.S. food assistance programs and the Economic Census Subject Series-Miscellaneous Subjects: Sales by Class of Customer report. Estimates of business purchases of food are primarily constructed using BEA's Annual Input-Output Accounts (BEA, 2017a) and other information on particular components of food furnished as an ancillary activity. Household food purchases are estimated as a residual of total food expenditures less government and business purchases.

FAH has two final purchasers—households and government. Businesses are not a source of final purchases for FAH because it is assumed that FAH sold to retail and foodservice establishments will be resold, either as is or transformed into another product, and the value of this sale will be captured in its final sale. The government purchases FAH primarily through U.S. Government food assistance programs like SNAP and WIC (FNS, 2017).

FAFH has all three final purchasers—government, businesses, and households. Governments purchase FAFH as expensed meals and for child nutrition programs like the NSLP, SBP, CACFP, and the Summer Food Service Program. Data on government purchases of FAFH as expensed meals are based on the Economic Census Miscellaneous Subjects, Class of Customer data, and data on child nutrition programs are provided by USDA's Food and Nutrition Service. Governments also purchase FAFH for Medicaid and Medicare beneficiaries who are in hospitals, nursing homes, and other institutions. Similarly, businesses purchase food through workers' compensation for employees who are inpatients at hospitals, nursing homes, and other institutions. Data on the percentage of total hospital and nursing home expenditures by final purchaser from the National Health Accounts (Centers for Medicare & Medicaid Services, 2016) are used to allocate food furnished at hospitals, nursing homes, and other institutions by final user. Businesses purchase meals at foodservice, recreational, and accommodation establishments as a part of conducting business, and the BEA Annual Input-Output Accounts' "use tables" provide annual estimates of the intermediate input purchases of foodservice industries (NAICS sectors 721, 711, 713, and 722).¹¹ Businesses also purchase food that is furnished to employees through business-related travel. To estimate this, data on the percentage of trips for business versus leisure travel (Airlines for Americans, 2016) are applied to the cost of food furnished on airlines.

Per Capita and Shares of Food Expenditures

FAH and FAFH expenditures by households and FAH and FAFH expenditures by all purchasers are normalized in a number of ways to help analyze trends and compare the Food Expenditure Series

¹¹ERS also considered using the Economic Census Miscellaneous Subjects, Sales by Class of Customer report, which said that around 92.9 percent of sales was to households, 6.1 percent to businesses, and 1 percent to government. However, BEA's annual I-O estimates use information from both the Class of Customer data and the BLS Telephone Point of Purchase Survey and reported the share of household purchasers of foodservice to be around 80 percent. Consistent with BEA, the Food Expenditure Series assumes that around 80 percent of restaurant sales were to households.

with other datasets. To make Food Expenditure Series estimates by households comparable to BEA's PCE and BLS's CE estimates, estimates of household final users are used as the numerator and include food assistance and other government-sponsored food expenditures. PCE and CE measure all household expenditures regardless of who is paying; therefore, household final-user estimates are used for the shares and per capita estimates.

For household final users, the Food Expenditure Series estimates FAH, FAFH, and total food expenditures per household, as well as FAH and FAFH expenditures as shares of DPI and total food expenditures. The number of households in the United States has increased consistently over time. By dividing household expenditures on FAH and FAFH by the number of households in the United States, it can be determined whether aggregate spending on FAH and FAFH is increasing because Americans are spending more on them. The number of households reported in the Current Population Survey is used to calculate these expenditures per household (U.S. Census, 2018k).

Analyzing household food expenditures as a share of DPI shows how consistent the data are with two well-known empirical laws: Engel's and Bennett's laws. Engel's Law states that as income increases, the proportion of the budget spent on food decreases (Engel, 1857). This implies that as households become wealthier, the share of income or total expenditures spent on food decreases until reaching a steady state, after which food demand is hardly responsive to changes in income. Bennett's Law states that as income increases, the composition of the food basket changes—the consumption of starchy staple foods declines, and the consumption of foods with greater levels of value-added (e.g., FAFH) increases (Bennett, 1941; Cirera and Masset, 2010). Bennett's Law reflects consumers' desire for variety in their diets. DPI from the National Income and Product Accounts (BEA, 2017b) is used as the denominator for these estimates.

To gauge the difference between the PCE and CE estimates and the Food Expenditure Series, food expenditures by all purchasers (households, government, and businesses) are expressed on a per capita basis and as a share of total food expenditures. The total U.S. population is from the National Income and Product Accounts (BEA, 2017b).

Advance, Revised, and Final Estimates

In producing the Food Expenditure Series, ERS attempts to strike a balance between accuracy and timeliness. The most complete and comprehensive data available are from the quinquennial Economic Census. However, these data are released 3 to 4 years after they are collected, decreasing their suitability for providing insight to policymakers with current food markets questions. The Census Bureau's annual surveys (i.e., ARTS, SAS, ASM, and AWTS) increase the timeliness of the Food Expenditure Series but would still require estimation to be lagged 2 years from the reference year.

New to this revision, ERS introduces a rollout of estimates that increases the timeliness of the Food Expenditure Series. The rollout begins with publication of *advance* estimates, which are lagged only 1 calendar year from the reference year. The advance estimates are replaced each year by *revised* estimates when more reliable data are available; these estimates are lagged 2 years. With the release of each Economic Census, the revised estimates are replaced with *final* estimates, which are lagged 3 to 8 years.

Most of the advance estimates are calculated using the quarterly/monthly Census Bureau survey data as an extrapolator. For the portion of the Food Expenditure Series based on Census Bureau annual survey data, the growth in the annual cumulative sum of monthly and quarterly data is used to extrapolate.

late the most current year of the annual revised estimates forward. For example, the rate of change in the annual cumulative sum of monthly sales for grocery stores between 2016 and 2017 is used to pull forward its 2016 revised annual estimate. The monthly and quarterly data are from the MRTS, MWTS, MMTS, and QSS. As shown in the last column of table 2, the industry sales data for the last month/quarter of the year are released 2 to 3 months later. The quarterly/monthly survey data are not as reliable as the annual survey data, but the cumulative sum of these estimates over a year can be used as an extrapolator for the annual survey data, later to be revised. Most of the industries listed with a NAICS code in tables 3a-3d are covered by Census Bureau monthly/quarterly data.

Because some industries are not measured by Census Bureau annual surveys and their monthly/quarterly counterparts, an alternative extrapolator is used. The CPI for FAH or FAFH, or PPI for foods and beverages purchases for immediate consumption are lagged only 1 month (see table 4 for more details). Hence, the advance estimates for industries based on non-Census data are derived by applying the rate of change in the CPIs or PPIs to their revised counterparts. Advance estimates based on this method assume that quantities acquired by individuals/households, government, and businesses are constant and that only prices are moving. This is not a satisfactory assumption but necessary to produce timelier estimates.

Monthly Estimates

ERS also produces monthly estimates of sales for FAH and FAFH. These are simplified from the annual estimates in the following ways: the monthly estimates exclude (1) for FAH, home production and donations; and (2) for FAFH, food revenues at schools and colleges, the value of FAFH furnished to employees or part of a secondary activity, and donations and government assistance. The primary datasets for the monthly estimates are the same as those for the advance annual estimates: MRTS, MWTS, MMTS, and QSS.¹² For service-based industries covered in the QSS, the proportional Denton method is used to generate a monthly series from the quarterly series (Denton, 1971; Bloem et al., 2001). New to this comprehensive revision, this method is also used at each annual revision to revise the monthly estimates so that their sum is the annual sales estimates for FAH and FAFH.

The objective of the Denton proportional method is to keep the ratio of the estimated quarterly or monthly series to the indicator series as constant as possible under the annual constraints. The final estimates tend to have the same period-to-period growth rates as the indicator series (Chen and Andrews, 2008). Mathematically, the proportional Denton method minimizes the quadratic differences between the ratio of the derived monthly estimate (M_t) and the monthly indicator variable (I_t) subject to the derived monthly estimates summing to the quarter or year (A_y) (Bloem et al., 2001):

$$\min_{M_1 \dots M_T} \sum_{t=2}^T \left(\frac{M_t}{I_t} - \frac{M_{t-1}}{I_{t-1}} \right)^2 \text{ s.t. } \sum_{t=2}^T M_t = A_y$$

¹²All of the monthly Census data are available from 1997 to 2017, but the QSS starts in 2004 for some of the food-selling service industries and in 2009 for others. The missing quarterly sales were imputed using predictions of sales (\hat{x}_q) for each industry (i) and quarter (q) based on a linear regression of quarterly sales on quarterly indicator variables, annual sales for the industry, and a linear time trend. To ensure that the sum of the imputed quarterly estimates sum to the annual, we prorate them as $\hat{x}_q^* = \hat{x}_q \left(\sum_{q=1}^4 \hat{x}_q / x_i \right) \forall i$ in the QSS. The regression model fits the data reasonably well (see appendix table A2 for details). Annual food sales for service industries that are imputed in this way constitute about 12 percent of FAFH sales and about 5 percent of all food sales, on average.

The International Monetary Fund regards the proportional Denton method as “relatively simple, robust, and well-suited for large-scale applications” (Bloem et al., 2001, p. 83), and the BEA uses the proportional Denton method in benchmarking quarterly estimates to annual estimates (Chen and Andrews, 2008). For deriving monthly sales estimates from the QSS, monthly employment data from the Current Employment Statistics Survey (BLS, 2017) are used as the indicator variable. The proportional Denton method is also used to revise the monthly estimates during the annual revision so that the monthly estimates sum to the annual data. In this case, the monthly estimates are used as the indicator variables in the equation above.

Timetable of Data Release

To complement this comprehensive revision, ERS established a timetable for data release that will increase the predictability and reliability of the estimates, thereby enhancing their usability by stakeholders. The timetable is primarily based on the release schedule of the monthly and annual Census data, which form the core of the Food Expenditure Series (see table 2).

The Food Expenditure Series monthly estimates are primarily based on the monthly and quarterly Census sales data. Census releases the MRTS, MWTS, and MSIO estimates with about a 2-month lag from the reference month and year.¹³ It releases the QSS estimates with about a 2-month lag from the reference quarter and year. Therefore, ERS releases the Food Expenditure Series monthly estimates with a 2-month lag from the reference month and year.

The Food Expenditure Series annual advance estimates are based on the summation of monthly/quarterly Census estimates of sales for a year. The monthly and quarterly sales estimates for December and the last quarter are released in the March of the following year. Similarly, the annual revised Food Expenditure estimates are based on the annual Census data (ARTS, SAS, AWTS, and ASM), which are released in March, 15 months after the reference year, and the SAS, which is released in November, about 12 months from the reference year. Therefore, ERS releases the advance and revised estimates in the spring of each year.

¹³The U.S. Census Bureau produces “advance,” “preliminary,” and “revised” estimates in the monthly/quarterly surveys. The “advance” estimates are based on early reports obtained from a small sample of firms from the MRTS and QSS samples. The “advance” MRTS and QSS are released 1 month after the reference month and 2 months after the reference quarter, respectively. The “revised” estimates, released 2 and 3 months after the reference month/quarter, are based on the entire MRTS and QSS samples. The Food Expenditure Series uses the “preliminary” and “revised” estimates for the monthly sales estimates and for the advance annual estimates.

Revisions

The comprehensive revision of the Food Expenditure Series revises previously published estimates between 1997 and 2014 and presents new estimates for 2015-17. Changes include: (1) reorganization and new presentation of the estimates, (2) inclusion of new source data and methods, and (3) advance estimates that are lagged only 1 year. While not discussed explicitly in this study, a major contributor to the revision of the Food Expenditure Series is the development of a new data processing system to manage and organize data, incorporating internal checks in data estimation to minimize error.

Reorganization of the Food Expenditure Series

The published tables in the Food Expenditure Series have been reorganized to bring clarity to the construction of the estimates. The previously published Food Expenditures Series consisted of 17 tables. Many included information repeated from other tables, and it was sometimes difficult to reconcile estimates from one table to another. In the comprehensive revision, the number of tables has been reduced to seven, eliminating the repeated information and combining similar information in one table. Information on food expenditures without taxes and tips was added. The Food Expenditure Series tables that are available to the public on the ERS website include:

1. Nominal annual food and alcohol expenditures with taxes and tips by outlet;
2. Nominal annual food and alcohol expenditures without taxes and tips by outlet;
3. Constant-dollar annual food and alcohol expenditures with taxes and tips by outlet;
4. Constant-dollar annual food and alcohol expenditures without taxes and tips by outlet;
5. Annual food expenditures by purchaser;
6. FAH and FAFH as shares of disposable personal income and food expenditures and per capita and household; and
7. Monthly food expenditures with taxes and tips.

Percentage of the Revised Food Expenditure Series Based on Census Data

To provide a sense of how much of each estimate is based on the highest quality and most reliable source data, table 5 separates the average of the nominal values of FAH and FAFH into the percentage that is based on Census Bureau data, the percentage that is based on other data sources, and the percentage that is based on taxes and tips. The U.S. Census Bureau is considered to be the source of the highest quality and most reliable data because it collects and publishes the Economic Census, which contains a census of establishments in most industries in the United States, uses stratified sampling for annual and monthly estimates that are benchmarked to the Economic Census, has strict standards for publication, and releases the data on a consistent basis.¹⁴ Data from other Federal statistical agencies are also of high quality, but these data are not sales data and are used in conjunction with other data that are of lower quality or are less reliable. For example, sales by

¹⁴Census suppresses estimates that have high sampling variability (coefficient of variation is greater than 30 percent), poor response quality (total quantity response rate is less than 50 percent), or if it has other concerns about the estimates' quality.

farmers directly to consumers for various years are available through USDA's Census of Agriculture and Local Food Marketing Practices Survey, which are of high quality but conducted only every 5 years. No good indicator is available between years when data are unavailable. Similarly, food sales at higher educational institutions are partially based on high-quality NCES data (enrollment times average board), but to calculate food sales, assumptions have to be made from a less reliable source about who is purchasing meal plans at these institutions (percent of student population that purchases meal plans from *Foodservice Director* magazine).

Table 5

Average composition of the revised Food Expenditure Series for all purchasers by data type, 1997-2017

Estimate	Total	U.S. Census- based sales	Non-U.S. Census- based sales or cost	Taxes and tips	Percent based on U.S. Census data
<i>Billion \$</i>					
FAH					
Food stores					
Grocery stores	345.15	337.83	0.00	7.32	97.88
Convenience stores	10.74	10.52	0.00	0.22	97.99
Other food stores	14.38	14.07	0.00	0.30	97.90
Other stores and foodservice					
Warehouse clubs and supercenters	102.84	100.70	0.00	2.15	97.91
Mass merchandisers	10.24	10.02	0.00	0.22	97.90
Other retail stores and foodservice	57.31	52.08	4.12	1.11	90.87
Home delivery and mail order	17.39	17.02	0.00	0.37	97.90
Direct selling by farmers, processors, and wholesalers	3.79	2.48	1.23	0.08	65.39
Home production and donations	1.54	0.00	1.54	0.00	0.00
Total	563.37	544.72	6.89	11.76	96.69
FAFH					
Eating and drinking places					
Full-service restaurants	203.14	165.01	0.00	38.13	81.23
Limited-service restaurants	196.35	183.47	0.00	12.89	93.44
Drinking places	3.19	2.58	0.00	0.62	80.71
Hotels and motels	23.95	19.35	0.00	4.60	80.79
Retail stores and vending machines	26.60	24.85	0.00	1.74	93.44
Recreational places	20.99	19.36	0.00	1.63	92.23
Schools and colleges	49.92	18.36	31.56	0.00	36.78
All other FAFH					
Other FAFH sales, NEC	17.03	15.68	0.25	1.10	92.07
Food furnished and donations	32.64	0.00	32.64	32.64	0.00
Total	573.80	448.65	64.44	60.71	78.19

FAH = food at home. FAFH = food away from home. NEC = not elsewhere classified.

Source: USDA, Economic Research Service calculations based on the comprehensive revision of the Food Expenditure Series.

Overall, an average of 96.7 percent of the FAH estimates between 1997 and 2017 are based on Census data—Economic Census, ARTS, SAS, and so on. The non-Census portion of the FAH estimates mostly reflects the addition of sales taxes (an average of \$11.8 billion)—tips are not applicable to FAH with the exception of FAH sales at other retail stores and foodservice—and by direct sellers (an average of \$6.9 billion). About 90.9 percent of the FAH sales at other retail stores and foodservice are based on Census data because Census does not include military commissaries and exchanges in its estimates (table 3a), so FAH sales at commissaries and exchanges are estimated using the IRI InfoScan and Defense Commissary Administration data. In addition, Census does not cover direct sales by farmers to consumers (e.g., roadside stands, farmers' markets, and so on), so various sources from USDA are used for these estimates.

Of the FAFH estimates between 1997 and 2017, 78.2 percent are, on average, based on Census data. The non-Census portion of the FAFH estimates is largely due to sales taxes and tips, food expenditures at higher educational institutions, and food furnished and donations. Sales taxes are larger for FAFH than for FAH (around 7.0 percent versus 2.0 percent), and tips are applied to FAFH sales at full-service restaurants, drinking places, and hotels and motels. An average of \$60.7 billion of FAFH is from the addition of sales taxes and tips. In addition, Census does not collect information on higher educational institutions (see table 3c). Data on average enrollment and board costs from NCES are used to estimate food sales at higher education institutions. This represents an average of about 63.3 percent of FAFH sold at schools and colleges. Food furnished as a secondary activity (e.g., to inpatients at hospitals, residents of nursing homes, prison inmates, and so on) is estimated as the population at each establishment times the average cost per meal or person from various sources (see table 4 for more details). In all, an average of \$64.4 billion of FAFH sales or costs is based on data from non-Census sources.

Validation of the Advance Estimates

Recall that the advance Food Expenditure Series estimates are extrapolations of the revised Food Expenditure Series pulled forward using the annual summation of monthly/quarterly sales (i.e., MRTS, QSS, MWTS, and MSIO) for the year or the annual CPI for FAH or FAFH. The December or fourth-quarter estimates for each year are lagged only 2 to 3 months after the reference year but are based on smaller sample sizes and exclude nonemployer establishments (U.S. Census Bureau, 2016f). Also, the response rates for the monthly/quarterly surveys are lower than for the annual surveys because establishments have more time to fill out the annual survey, and the annual surveys and Economic Census are mandatory by law (U.S. Census Bureau, 2016b). Because of this, the Census Bureau benchmarks the monthly/quarterly series to the annual series (i.e., ARTS, SAS, AWTS, and ASM), which are lagged 15 months after the reference year. To increase its timeliness, the advance Food Expenditure Series incorporates the monthly/quarterly Census data before they are benchmarked to their annual counterparts.

Since much of the Food Expenditure Series is based on Census data (i.e., an average of 96.7 and 78.2 percent of FAH and FAFH, respectively), one way to gauge how closely the advance Food Expenditure Series estimates will predict the revised estimates is to compare the unbenchmarked annual cumulative sum of the monthly/quarterly Census data as an extrapolator to its annual counterparts. Table 6 reports the growth rates for the annual cumulative sum of the Census monthly/quarterly and annual survey data between 2012 and 2016 for selected NAICS industries that constitute the largest shares of the Food Expenditure Series.¹⁵

¹⁵The monthly/quarterly data in table 6 are not benchmarked to the annual series, and the “preliminary” fourth quarter QSS estimates are used.

Table 6

Comparison of growth rates of selected NAICS industries across U.S. Census datasets, 2012-16

NAICS industry	Annual percentage change in sales using monthly/quarterly surveys					Annual percentage change in sales using annual survey					Absolute average percentage point difference	
	2012/ 13	2013/ 14	2014/ 15	2015/ 16	Average	2012/ 13	2013/ 14	2014/ 15	2015/ 16	Average		
<i>Percent</i>												
Retail trade surveys												
445	3.54	4.42	1.77	2.99	3.18	2.01	4.42	2.42	2.25	2.78	0.41	
4451	2.79	3.52	1.14	2.80	2.56	1.93	4.36	2.26	1.98	2.63	0.07	
4453	7.00	7.36	5.12	5.96	6.36	3.86	4.80	4.69	5.35	4.67	1.69	
4521	-1.59	-1.21	-1.51	-1.22	-1.38	-4.01	-1.25	-2.40	-6.85	-3.63	2.25	
4529	3.83	3.58	2.52	2.53	3.11	3.59	3.62	2.36	2.52	3.02	0.09	
45291	2.59	3.47	1.65	1.82	2.38	3.21	3.32	1.95	1.95	2.61	0.22	
45299	5.89	-0.20	3.57	3.73	3.25	6.17	5.58	5.05	6.23	5.76	2.51	
454	11.89	11.04	3.70	9.71	9.09	6.11	8.71	8.24	10.03	8.27	0.81	
Service surveys												
512	14.43	13.12	7.33	4.86	9.93	3.36	-0.07	4.41	4.82	3.13	6.80	
711	2.41	7.33	9.89	6.26	6.47	3.88	7.20	7.47	5.55	6.03	0.45	
712	-4.95	-6.09	2.17	3.57	-1.32	9.82	5.43	-4.55	-0.90	2.45	3.77	
713	9.35	11.52	3.87	6.44	7.79	4.77	4.63	6.05	5.27	5.18	2.62	
721*	NA	3.82	3.74	4.05	3.87	5.11	6.04	5.91	4.91	5.49	1.62	
722*	5.24	5.25	8.00	5.71	6.05	3.65	6.06	8.13	5.70	5.88	0.17	

NAICS = North American Industry Classification System. NA = not available.

Note: The Quarterly Services Survey (QSS) for NAICS 721 (Accommodation) began in the third quarter of 2012, so no growth is reported for 2012-13. *NAICS industries 721 (Accommodation) and 722 (Foodservice) were reported in the Annual Retail Trade Survey for 2012-2015. For the 2016 release, revenues from these NAICS industries were reported in the Service Annual Survey.

Source: USDA, Economic Research Service compilation of U.S. Census Bureau data: the QSS and Monthly Retail Trade Surveys (MRTS) that are not benchmarked to their annual counterparts (U.S. Census Bureau, 2018a, b); the QSS and MRTS that are benchmarked to their annual counterparts (U.S. Census Bureau, 2018c, d); and Annual Retail Trade Survey (ARTS) and Service Annual Survey (SAS) (U.S. Census Bureau, 2016a, b).

For most industries, the growth shown in the monthly surveys mirrors that reported in their annual counterparts. Between 2012 and 2016, the average absolute percentage point difference in rates of change in total sales for retail industries is between 0.1 and 2.5 percentage points for NAICS 4451 (grocery stores) and 45299 (variety and catalog stores), respectively. The average absolute percentage point difference in rates of change of total sales for service industries is between 0.2 and 6.8 percentage points for NAICS 722 (foodservices) and 512 (motion picture theaters), respectively. The difference in rates of change in sales between the monthly/quarterly and annual surveys varies across years, but for the largest components in the Food Expenditure Series, including NAICS 4451 (grocery stores), NAICS 45291 (warehouse clubs and supercenters), and NAICS 722 (foodservice), the differences are within 0.1 to 2.5 percentage points across years. Because the unbenchmark growth for the major food industries in the monthly/quarterly surveys mirrors that of the annual series, revisions to the advance estimates from year to year will likely be relatively small.

Direct comparison of the advance to revised estimates for 2016 are shown in table 7. For the biggest components of FAH in the Food Expenditure Series—grocery stores, and warehouse clubs and supercenters—the difference in magnitude between the advance and revised estimates for 2016 would have resulted in a 0.4-percent downward revision for grocery stores and a 0.1-percent downward revision for warehouse clubs and supercenters. For the FAFH estimates, the revisions would have been larger, a 1.7-percent downward revision for full-service restaurants, and a 1.6-percent upward revision for limited-service restaurants. In FAH, home production and donations would have had a fairly large downward revision between the 2016 advance and revised estimates, around 77.0 percent, but these are measured fairly imprecisely to begin with and constitute less than 1.0 percent of food expenditures.

Comparison of Previously Published and Comprehensive Revision Estimates

The estimates in the comprehensive revision of the Food Expenditure Series can be different from the previously published estimates. Table 8 compares the previously published and revised nominal estimates for FAH and FAFH and their disaggregated counterparts between 1997 and 2014, the last year the previously published estimates were available. Unless discussed in this section, the methods and data sources used in the previously published and the comprehensive revision estimates are similar.

Table 7

Differences in advance and revised estimates for all purchasers for 2016

	2016 estimates		Difference	
	Advance	Revised	Billion \$	Percent
FAH				
Grocery stores	429.22	427.75	-1.48	-0.35
Convenience stores	13.45	13.64	0.19	1.40
Other food stores	17.94	18.21	0.27	1.47
Warehouse clubs and supercenters	157.56	157.49	-0.08	-0.05
Mass merchandisers	9.47	9.43	-0.04	-0.40
Other retail stores and foodservice	70.27	70.64	0.36	0.51
Home delivery and mail order	21.23	21.23	0.00	0.02
Direct selling by farmers, processors, wholesalers	5.65	5.83	0.17	2.98
Home production and donations	1.80	1.01	-0.79	-77.41
FAFH				
Full-service restaurants	306.75	301.57	-5.18	-1.72
Limited-service restaurants	301.21	306.07	4.86	1.59
Drinking places	4.50	4.35	-0.15	-3.44
Hotels and motels	34.09	34.53	0.44	1.26
Schools and colleges	69.51	67.74	-1.78	-2.63
Retail stores and vending machines	34.93	34.99	0.05	0.15
Recreational places	28.26	29.57	1.31	4.43
Other FAFH sales, NEC	42.77	43.24	0.47	1.08
Food furnished and donations	22.61	22.50	-0.11	-0.49

FAH = food at home. FAFH = food away from home. NEC = not elsewhere classified.

Note: The advance estimates are based on extrapolations using the cumulative sum of the U.S. Census monthly/quarterly estimates for 2016 and other less reliable data sources (see table 4 for more details).

Source: USDA, Economic Research Service calculations based on the comprehensive revision of the Food Expenditure Series.

Table 8

**Differences between previous published and comprehensive revision estimates for all purchasers
(with taxes and tips), 1997-2014**

Outlet type	Average difference		Average share				Average change							
			Comprehensive revision	Previously published	Comprehensive revision	Previously published								
	Billion \$	Percent	Percent											
FAH														
Food stores	3.94	1.12	67.20	(4.93)	63.66	(4.08)	2.47	(1.51)	2.50	(1.42)				
Grocery stores	-123.43	-27.15	62.66	(4.51)	65.59	(3.09)	2.48	(1.58)	2.82	(1.43)				
Convenience stores	-6.80	-39.90	1.96	(0.34)	2.45	(0.10)	1.86	(5.78)	2.85	(2.61)				
Other food stores	-6.60	-32.50	2.58	(0.13)	2.94	(0.24)	2.92	(2.51)	2.00	(5.63)				
Other stores and food-service	29.48	22.79	28.70	(5.20)	22.39	(4.79)	7.44	(4.28)	8.78	(6.35)				
Warehouse clubs and supercenters	4.14	4.62	16.55	(5.07)	12.10	(4.21)	11.41	(7.22)	14.28	(12.61)				
Mass merchandisers	3.58	52.90	1.97	(0.23)	1.05	(0.49)	1.21	(3.44)	-3.75	(5.93)				
Other retail stores and foodservice	21.77	65.73	10.18	(0.48)	4.72	(0.12)	4.34	(5.66)	3.96	(2.39)				
Home delivered and mail order	-2.38	-12.48	3.16	(0.27)	3.52	(0.56)	3.35	(5.06)	0.92	(3.47)				
Direct selling by farmers, processors, and wholesalers	-36.43	-91.35	0.66	(0.16)	7.16	(0.27)	1.80	(8.82)	3.20	(4.28)				
Home production and donations	-17.00	-93.21	0.28	(0.03)	3.26	(0.11)	3.69	(11.55)	3.41	(4.27)				
FAFH														
Eating and drinking places	-10.96	-2.97	69.49	(0.75)	73.37	(0.78)	4.96	(2.05)	4.97	(2.84)				
Full-service restaurants	-14.38	-7.69	35.31	(0.48)	38.95	(0.49)	4.86	(2.63)	4.98	(2.75)				
Limited-service restaurants	3.74	2.09	33.63	(0.63)	33.79	(0.72)	5.07	(1.71)	4.99	(4.24)				
Drinking places	-0.32	-10.78	0.56	(0.04)	0.63	(0.08)	5.10	(3.99)	5.87	(6.94)				
Hotels and motels	-0.69	-3.13	4.29	(0.56)	4.51	(0.44)	4.05	(5.48)	3.36	(3.96)				
Retail stores and vending machines	5.71	22.74	4.68	(0.37)	3.75	(0.30)	6.52	(5.59)	5.32	(4.61)				
Recreational places	-0.79	-4.06	3.73	(0.37)	3.91	(0.20)	5.34	(8.04)	5.06	(3.48)				
Schools and colleges	12.64	26.89	8.80	(0.50)	6.61	(0.31)	4.90	(2.62)	5.09	(1.50)				
All other FAFH	7.36	15.63	9.00	(0.53)	7.85	(0.71)	3.55	(2.53)	3.01	(1.57)				
Other FAFH sales, NEC	6.75	41.64	3.09	(0.22)	1.86	(0.12)	3.90	(4.65)	3.38	(3.06)				
Food furnished and donations	0.61	1.98	5.91	(0.38)	6.00	(0.60)	3.41	(1.97)	2.90	(1.58)				

FAH = food at home. FAFH = food away from home. NEC = not elsewhere classified.

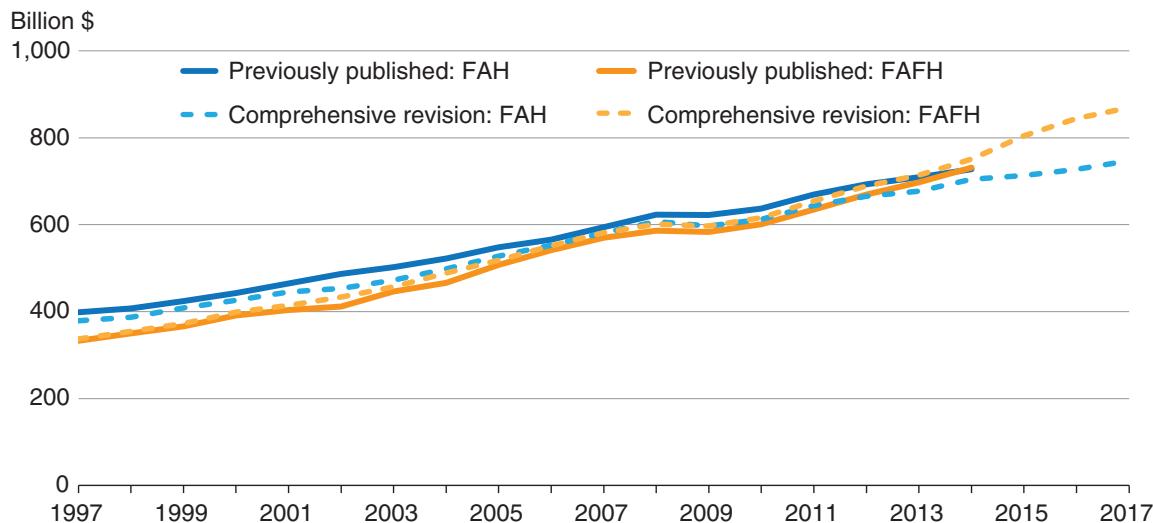
Note: Estimates in parenthesis are standard deviations.

Source: USDA, Economic Research Service calculations based on the comprehensive revision of the Food Expenditure Series and tables 2, 3, 14, and 15 of the previously published Food Expenditure Series.

Expenditures by all purchasers (households, government, and businesses) for FAH between 1997 and 2014 were revised downward by an average of \$22.4 billion (-4.2 percent), and expenditures for FAFH were revised upward by an average of \$13.3 billion (+2.5 percent). While the revised and the previously published FAH and FAFH estimates mostly grew at the same rate from year to year, the difference in magnitude of the estimates resulted in FAFH expenditures overtaking FAH expenditures as a share of total food expenditures in 2010 (fig. 2). In the previously published estimates, FAFH expenditures overtook FAH expenditures in 2014.

All of the estimates are affected by the incorporation of the 2012 Economic Census and new sales tax rates. The differences are bigger for the FAH estimates than the FAFH estimates, largely driven by errors in estimation in the previously published series and differences in the sales tax rates. For example, between 1997 and 2014, the average difference between the comprehensive revision and the previously published estimate for food stores sales is +\$3.9 billion or +1.1 percent (table 8). Food stores consist of grocery stores, convenience stores, and other food stores, so it is interesting to note that the average difference for grocery stores is -\$123.4 billion; for convenience stores, -\$6.8 billion; and for other food stores, -\$6.6 billion. The differences in the disaggregated estimates resulted from errors in calculation. For example, the previously published estimate for grocery stores reflects total sales rather than the subset of food sales (e.g., no nonfood adjustment). In the previous data processing system, the sum of the disaggregated estimates were not checked against the aggregated estimates; FAH sales at grocery stores, convenience stores, and other food stores were estimated separately from that of FAH sales at food stores. The new data processing system estimates the disaggregated series and sums these to the aggregated values each year. A system of checks has also been incorporated in the new data processing system to minimize errors by the analyst.

Figure 2
Comparison of previously published and comprehensive revision estimates of FAH and FAFH expenditures by all purchasers, 1997-2017



FAH = food at home. FAFH = food away from home.

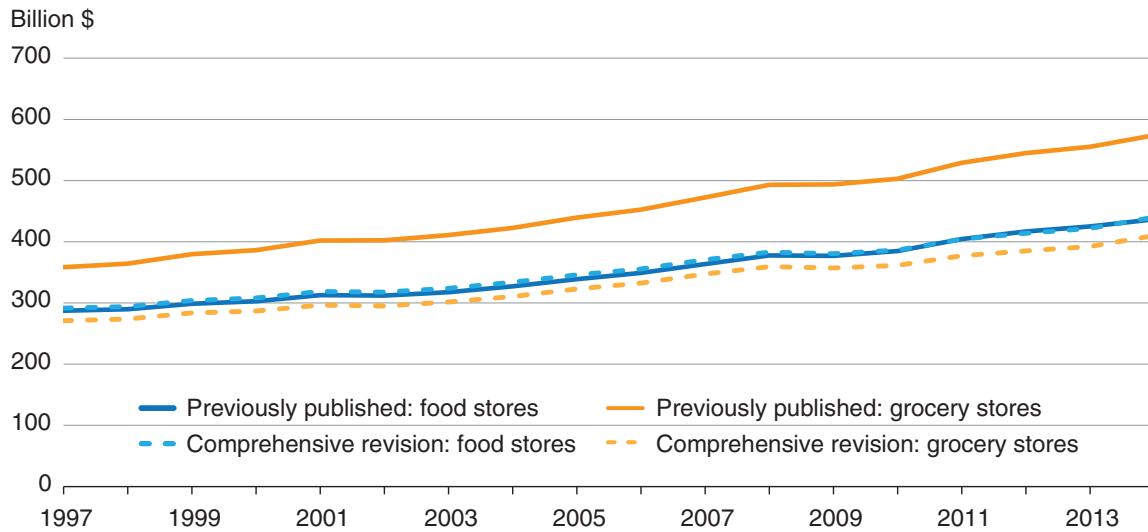
Note: The previously published Food Expenditure Series goes only to 2014.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series and table 1 of the previously published Food Expenditure Series.

For the FAH estimates, changes in the methods and source data made the biggest difference in the estimates for direct selling by farmers, manufacturers and wholesalers, and for home production and donations. In the previously published series, estimates for home production and direct selling by farmers were derived from a base value from a one-time survey in 1969 or 1977 that was pulled forward using the CPI for all items (see Manchester and King (1979) for more details). As noted in table 4, the main source for direct selling by farmers in the comprehensive revision is the Census of Agriculture and Local Food Marketing Practices Survey. The data sources for home production are the NHANES (CDC, NCHS, various years b), the BLS Average Price Database (BLS, 2018d), and the ERS Farm and Income Wealth Statistics (USDA, ERS, 2016), which are updated monthly and annually. These methodology and source data changes resulted in most of the \$36.4 billion downward revision in direct selling and the \$17.0 billion downward revision in the home production and donations estimates. Consequently, the average share of the FAH market declined for direct selling by farmers, manufacturers and wholesalers from 7.2 to 0.7 percent, and for home production and donations from 3.3 to 0.3 percent.

The comprehensive revision mostly affected the magnitude of the FAH estimates, but in some cases, the trends in the series also changed. For food stores, which comprise the largest component of FAH, the growth in sales for the comprehensive revision parallels that of the previously published estimates. While the magnitude of the estimates for grocery store sales is markedly different in the comprehensive revision and the previously published series, they grow at the same rate over the period of analysis (fig. 3). However, that is not the case with mass merchandiser sales. In the comprehensive revision, the average growth of mass merchandiser sales between 1997 and 2014 was positive (+1.2 percent), while in the previously published estimates, it was negative (-3.8 percent). Similarly, in the comprehensive revision, mass merchandiser food sales dipped in 2007, but the previously published estimates showed the same sales falling since 2002 (fig. 4). This difference is mainly due to differences in the nonfood adjustment calculated using the 2012 Economic Census.

Figure 3
Comparison of previously published and comprehensive revision estimates of food store and grocery store sales by all purchasers with taxes, 1997-2014

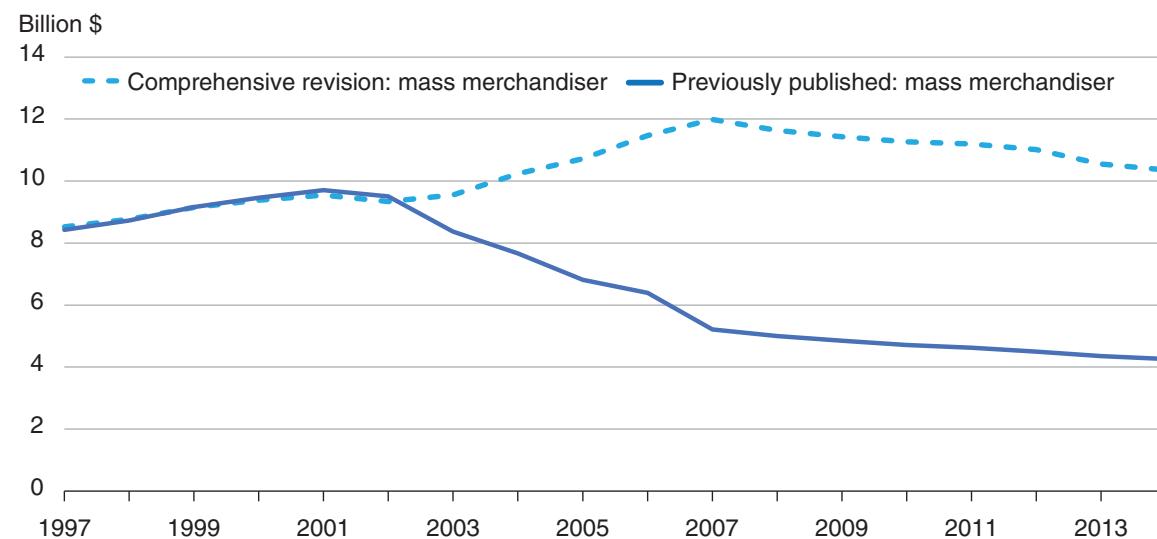


Note: Food store sales include sales at grocery, convenience, and other food stores.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series and table 2 of the previously published Food Expenditure Series.

Figure 4

Comparison of previously published and comprehensive revision estimates of mass merchandiser sales by all purchasers with taxes, 1997-2014



Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series and table 14 of the previously published Food Expenditure Series.

For FAFH estimates, sales at full-service restaurants have the biggest change in magnitude, with an average downward revision of \$14.4 billion between 1997 and 2014. FAFH sales at full-service restaurants include catering and mobile food vendors, and these sales are measured differently in the comprehensive revision. In the previously published estimates, sales by catering and mobile food vendors were assumed to be a fixed proportion of full-service sales; the comprehensive revision uses the on-premises food sales reported for catering and mobile food vendors in the Economic Census (NAICS industries 72232 and 72233). This average downward revision did not change trends in the series (fig. 5) and results in an average downward revision of sales at full-service restaurants of only 7.7 percent. In terms of percent revision, the largest were for other FAFH sales, not elsewhere classified (NEC), up 41.6 percent; retail stores and vending machines, up 22.7 percent; and schools and colleges, up 26.9 percent.

The upward revision to food expenditures at other FAFH sales, NEC, reflects the introduction of new source data on food sales at establishments not included in the previously published Food Expenditure Series. For example, in addition to accounting for the cost of food furnished to inpatients at hospitals and nursing homes in the category FAFH furnished and donations, estimates of food sales at cafeterias in hospitals and nursing homes are also included in other FAFH sales, NEC. In previously published estimates, only food furnished to hospital inpatients and nursing home residents was included. According to *Food Service Director* magazine (2016), inpatient meals account for 40 percent of meals served at hospitals, while the remaining 60 percent are retail sales. The sales of food reported in the Economic Census are assumed to be for retail sales at hospitals and nursing homes.¹⁶ Additionally, information from the Economic Census Miscellaneous Subjects Series is incorporated in

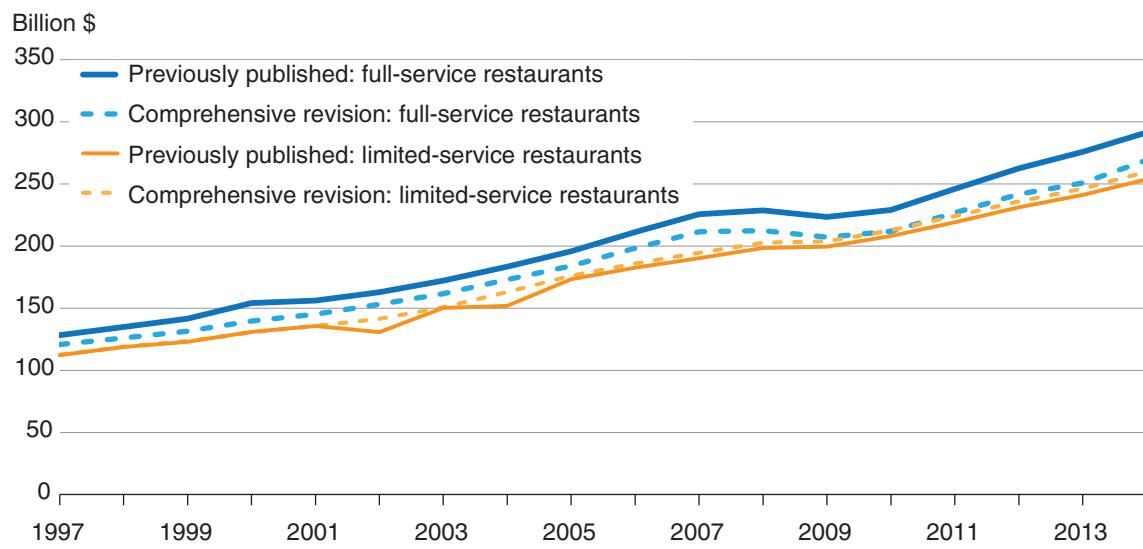
¹⁶We assume that the product line “Food and beverage sales including cafeteria” is retail sales in the Economic Census for NAICS 622 (Hospitals) and 623 (Nursing and residential care facilities). The product line “Payments for inpatient nursing and residential services” is assumed to contain food furnished revenues, which we estimate using the cost per meal per day times the average number of inpatients per day.

the percentage breakdown of food contracting in commercial office buildings, in manufacturing and industrial plants, and in government facilities. In previously published estimates, food sales in commercial office buildings and in manufacturing and industrial plants were estimated using values from a one-time survey in 1969 pulled forward with a CPI (see Manchester and King, 1979).

The upward revision of food revenues at educational institutions also reflects differences in source data and methods for measuring food revenues at elementary and secondary schools. The comprehensive revision uses food revenues from local, State, and Federal sources reported in the Annual Survey of School System Finances, collected by the Census Bureau. Most of the Federal food revenue reported consists of payments for child nutrition programs (e.g., NSLP and SBP). In the previously published estimates, food revenues at public elementary and secondary schools were based on data reported in the U.S. Statistical Abstract. The U.S. Statistical Abstract was discontinued in 2012, and food revenues at public elementary and secondary schools were pulled forward using the CPI for school and employee meals and augmented with child nutrition subsidies reported by USDA's Food and Nutrition Service (FNS). Over time, the comprehensive revision and previously published estimates generally trend together except for the most recent years (fig. 6).

The 4.1-percent downward revision in sales of food at recreational places is attributable to accounting for industries that sell food but were not included in the previously published estimates. Employer establishments in the casinos and gambling (NAICS 7132); performing arts companies (NAICS 7111); promoters of performing arts, sports, and similar (NAICS 7113); and independent artists, writers, and performers (NAICS 7115) industries reported sales of food and alcohol for on-premises consumption in the 2012 Economic Census. These accounted for about 21.0 percent of sales of food at recreational places in the 2014 comprehensive revision estimates.

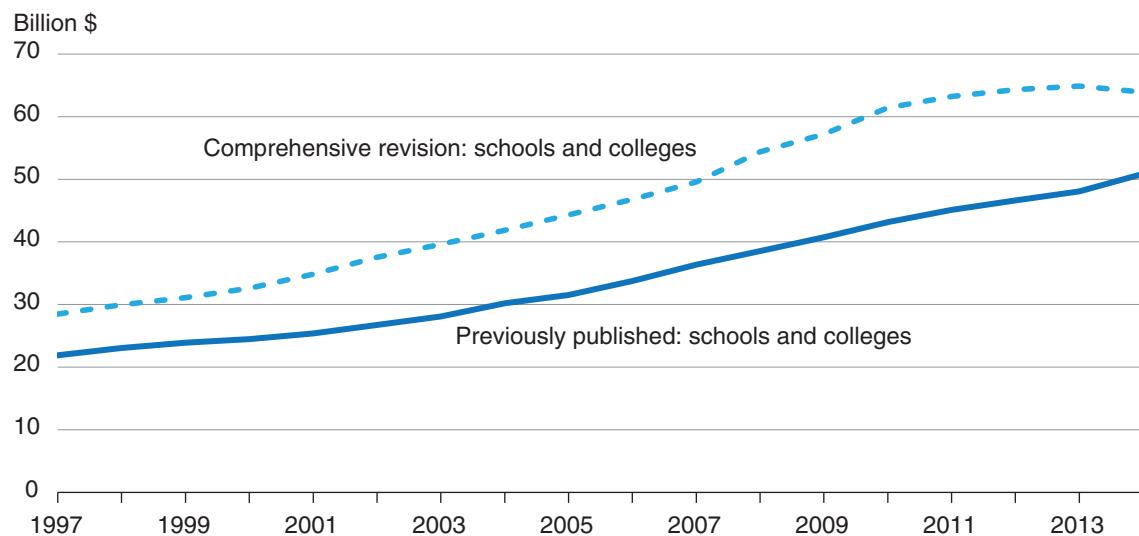
Figure 5
Comparison of previously published and comprehensive revision estimates of sales by all purchasers at full- and limited-service restaurants with taxes and tips, 1997-2014



Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series and table 15 of the previously published Food Expenditure Series.

Figure 6

Comparison of previously published and comprehensive revision estimates of revenues by all purchasers at schools and colleges, 1997-2014



Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series and table 3 of the previously published Food Expenditure Series.

Comparison of the Food Expenditure Series With the PCE and CE Data

The Food Expenditure Series is a unique dataset that represents the value of all food acquired in the United States. It differs in important ways from BEA's PCE and BLS's CE. PCE and CE represent sales to households of food purchased in the United States. Many of the tables in the comprehensive revision of the Food Expenditure Series encompass sales to all purchasers—households, government, and businesses. Table 9 compares average food expenditures by type of purchaser (in billions of dollars) and as a share of total food expenditure between 1997 and 2014 for the comprehensive revision and the previously published estimates.

Households constitute the largest share of final purchasers at 85.8 percent, on average, for the comprehensive revision, an average 4.8-percentage-point increase over the previously published estimates. About 6.1 percent of food expenditures, on average, are purchased by government. This represents government food and nutrition subsidies from SNAP, WIC, NSLP, SBP, and CACFP; a portion of food furnished at hospitals and nursing homes (through Medicaid and Medicare), prisons, and other institutions; and expensed government meal purchases. Almost 8 percent of final purchasers are businesses, which include businesses purchasing expensed meals at restaurants, recreational places, and hotels and motels, and a portion of food furnished at hospitals and nursing homes and on airlines.

FAH and FAFH expenditures by final purchaser in the comprehensive revision are shown in figure 7.¹⁷ On average, 79.2 percent of FAFH expenditures are by households, 16.2 percent by businesses, and 4.6 percent by government. Therefore, total food expenditure estimates in the Food Expenditure Series can be expected to deviate from the CE and PCE estimates, which only include household purchasers, by 10-20 percent. On average, an estimated 91.7 percent of FAH expenditures in the Food Expenditure Series are by household purchasers (including the value of home production) and 8.0 percent are by government—SNAP, WIC, and TEFAP special distributions. Note that SNAP and WIC are included in household food purchases in the PCE and CE estimates of FAH.

Table 9
Comparison of previously published and comprehensive revision estimated average food expenditures with taxes and tips by source of purchaser, 1997-2014

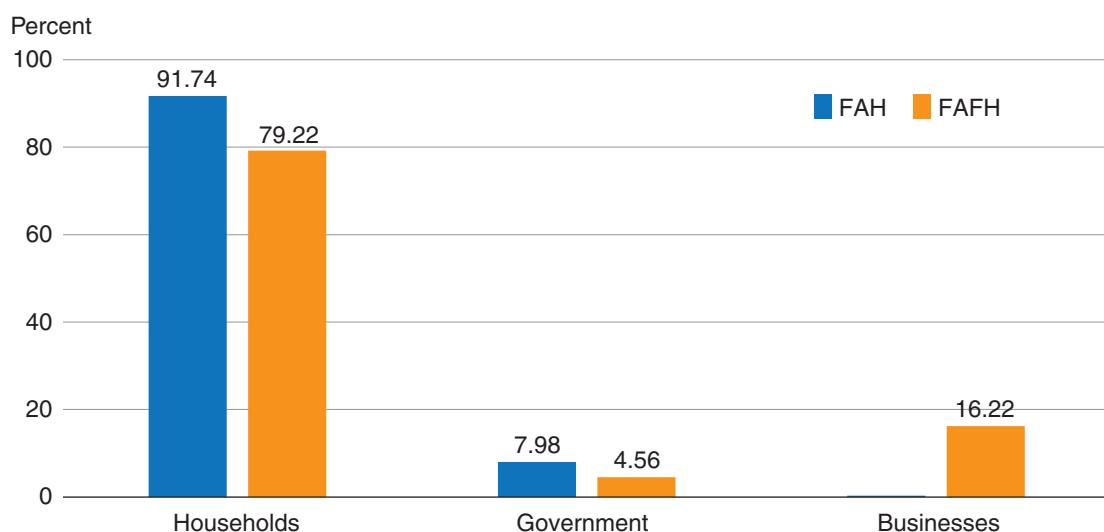
	Households	Home production	Government	Businesses	Households	Home production	Government	Businesses
<i>Billions \$</i>					<i>Percent of total expenditures</i>			
Previously published	867.66 (168.14)	17.63 (3.43)	75.73 (30.39)	113.09 (25.96)	81.06 (1.53)	1.65 (0.07)	6.80 (1.39)	10.48 (0.23)
Comprehensive revision	911.93 (181.92)	1.48 (0.02)	67.74 (29.35)	84.58 (19.24)	85.83 (1.51)	0.14 (0.02)	6.10 (1.44)	7.93 (0.31)

Note: Standard deviations are in parenthesis.

Source: USDA, Economic Research Service calculations based on the comprehensive revision of the Food Expenditure Series and table 5 of the previously published Food Expenditure Series.

¹⁷The previously published estimates did not include information on FAH and FAFH expenditures by final purchaser.

Figure 7
Average allocation of FAH and FAFH by final purchaser in the comprehensive revision, 1997-2017



FAH = food at home. FAFH = food away from home.

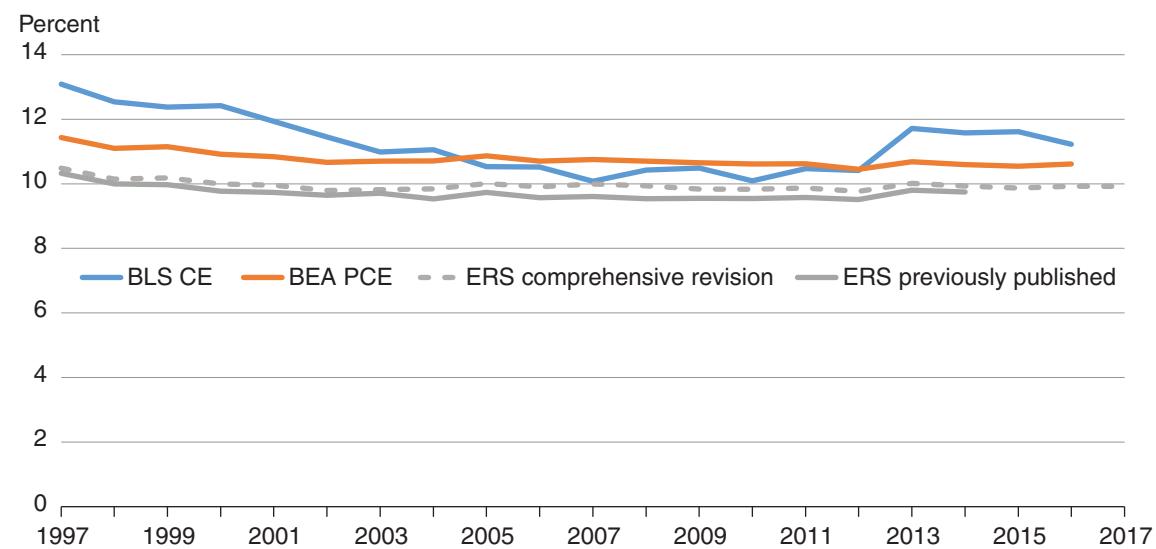
Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

As noted earlier, the comprehensive revision distinguishes between final purchasers and final users to make the Food Expenditure Series more comparable to the PCE and CE. The primary difference is that SNAP and WIC purchases are allocated to household rather than government final users. Household final-user estimates are then calculated per capita and as a share of DPI and total food expenditures (figs. 8 and 9). Household final-user food expenditures as a share of DPI for all the estimates except CE fall slightly between 1997 and 2004 and are somewhat stable thereafter, hovering around 10.0 percent for the Food Expenditure Series and 10.8 percent for the PCE (fig. 8). This is consistent with Engel's law. Households' FAFH share of total food expenditures in the comprehensive revision of the Food Expenditure Series generally follows the PCE estimates (fig. 9). All four series (i.e., CE, PCE, the previously published Food Expenditure Series, and the comprehensive revision of Food the Expenditure Series) show a generally upward trend in the share of food expenditures attributable to FAFH until 2007, when it fell or was flat until 2011 (CE shows a decline until 2013), when it started to trend up again. This is consistent with Bennett's law. Between 1997 and 2014, the PCE and comprehensive revision estimate the average FAFH share of households' food expenditures to be close to 45.7 and 43.2 percent, respectively. The previously published Food Expenditure estimates were more in line with the CE, with the average FAFH share of household's food expenditures closer to 41.3 percent.

Comparing the average FAH and FAFH household final-user expenditures across datasets, the comprehensive revision to the Food Expenditure Series generally follows the same trends as the PCE and CE, but more closely mirrors the PCE (fig. 10). This is expected since the PCE and the Food Expenditure Series use similar source data in their calculations (i.e., the Economic Census and the U.S. Census annual surveys). However, the magnitude of the PCE estimates is consistently larger. On average, the PCE estimate of average FAH expenditures by household final users between 1997 and 2016 is \$429 million larger than the Food Expenditure Series. Similarly, the estimate of average FAFH expenditures by households is \$218 million larger for the PCE compared to the Food Expenditure Series. Overall, the aggregate estimates of household expenditures on FAH and FAFH in the Food Expenditure Series are consistent with PCE and CE estimates but are closer to the PCE estimates.

Figure 8

Comparison of household final-user food expenditure share of disposable personal income across datasets, 1997-2017



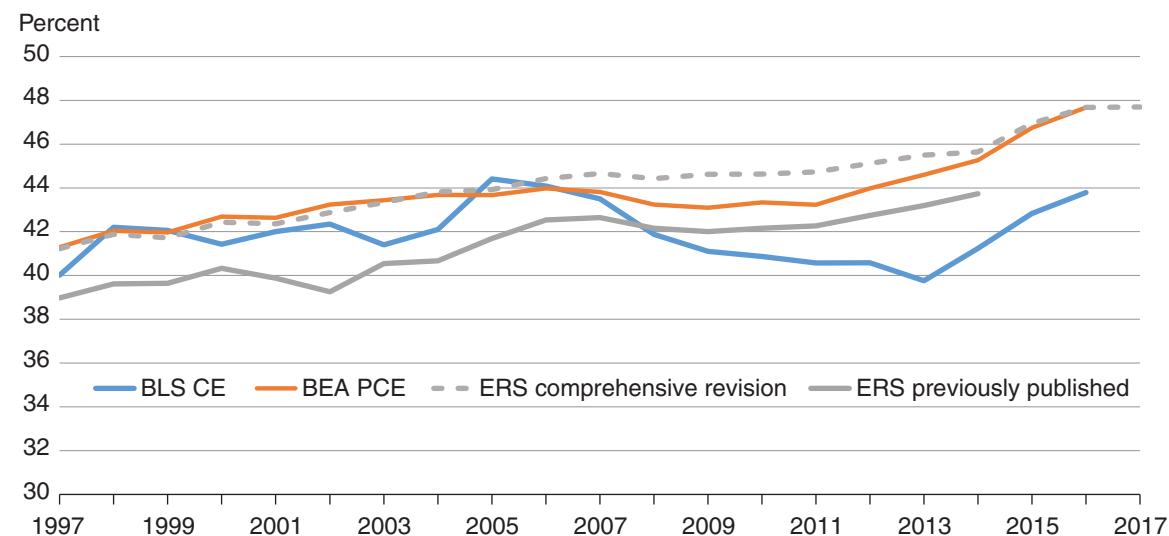
BLS = Bureau of Labor Statistics. CE = Consumer Expenditures. BEA = Bureau of Economic Analysis. PCE = Personal Consumption Expenditures. ERS = Economic Research Service.

Note: The CE and PCE estimates go through 2016. The previously published Food Expenditure Series goes through 2014, and the revised Food Expenditure Series goes through 2017 (2017 estimate is the advance estimate).

Source: USDA, ERS comprehensive revision of the Food Expenditure Series; table 7 of the previously published Food Expenditure Series; U.S. Department of Commerce, BEA PCE estimates (BEA, 2016b); and U.S. Department of Labor, BLS CE estimates (BLS, 2017).

Figure 9

Comparison of household final-user FAFH share of total food expenditures across datasets, 1997-2017

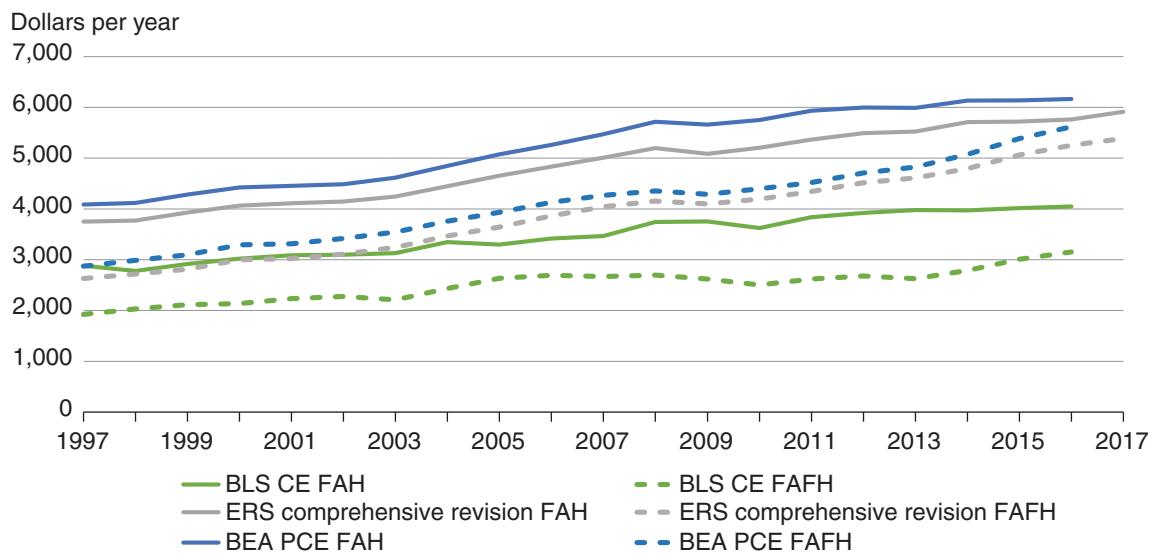


FAFH = food away from home. BLS = Bureau of Labor Statistics. CE = Consumer Expenditures. BEA = Bureau of Economic Analysis. PCE = Personal Consumption Expenditures. ERS = Economic Research Service.

Note: The CE and PCE estimates go through 2016. The previously published Food Expenditure Series goes through 2014, and the revised Food Expenditure Series goes through 2017 (2017 estimate is the advance estimate).

Source: USDA, ERS comprehensive revision of the Food Expenditure Series; table 7 of the previously published Food Expenditure Series; U.S. Department of Commerce, BEA PCE estimates (BEA, 2016b); and U.S. Department of Labor, BLS CE estimates (BLS, 2017).

Figure 10
Comparison of average household final-user food expenditures across datasets, 1997–2017



FAH = food at home. FAFH = food away from home. BEA = Bureau of Economic Analysis. PCE = Personal Consumption Expenditures. BLS = Bureau of Labor Statistics. CE = Consumer Expenditures. ERS = Economic Research Service.

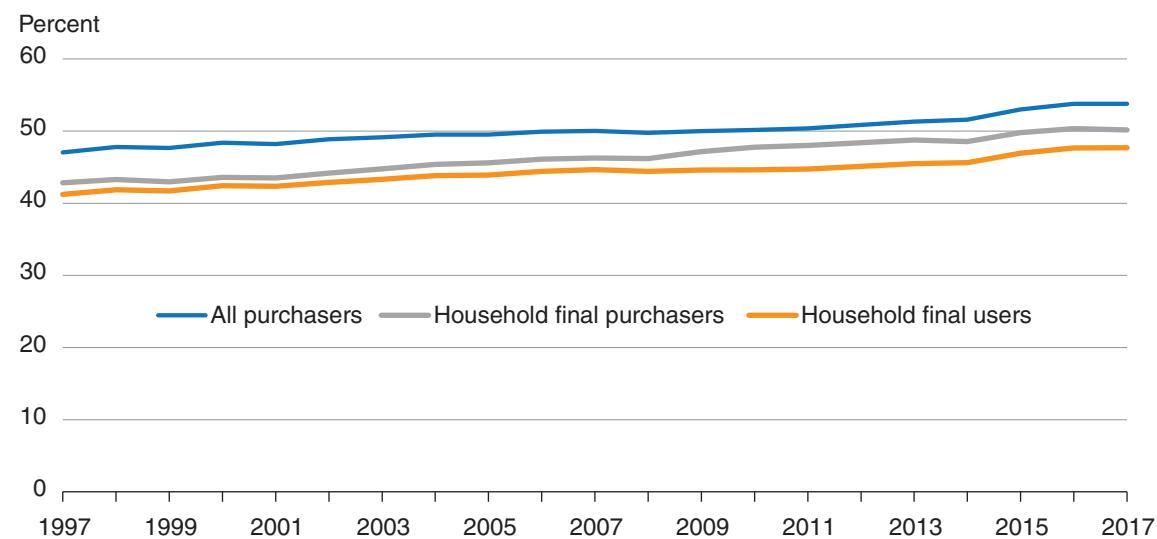
Note: The Food Expenditure Series and PCE estimates are normalized to a per household basis using the number of households from the Current Population Survey (2017). The estimate for the 2017 Food Expenditure Series is the advance estimate. The PCE and CE estimates go to 2016.

Source: USDA, ERS comprehensive revision of the Food Expenditure Series; table 7 of the previously published Food Expenditure Series; U.S. Department of Commerce, BEA PCE estimates (BEA, 2016b); and U.S. Department of Labor, BLS CE estimates (BLS, 2017).

Figure 11 shows the FAFH share of total food expenditures by all purchasers, household final purchasers, and household final users in the comprehensive revision of the Food Expenditure Series. Not unexpectedly, the FAFH share for all purchasers is generally 5.3 to 6.1 percentage points greater than the FAFH share for household final purchasers. This reflects business purchases of meals and snacks served at restaurants, hotels and motels, recreational places, and hospitals and nursing homes. The FAFH share for household final purchasers is generally 1.2 to 3.3 percentage points greater than the FAFH share for household final users. This reflects SNAP and WIC purchases counted as household for the final-use estimates (rather than government, as was the case in the final-purchaser estimates), which increases FAH's share of food expenditures relative to FAFH. The shares grow at a comparable rate from year to year, with negative growth in the shares in 1999, 2001, and 2007.

Figure 11

FAFH share of total food expenditures by all purchasers, household final purchasers, household final users, 1997-2017



FAFH = food away from home.

Note: The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

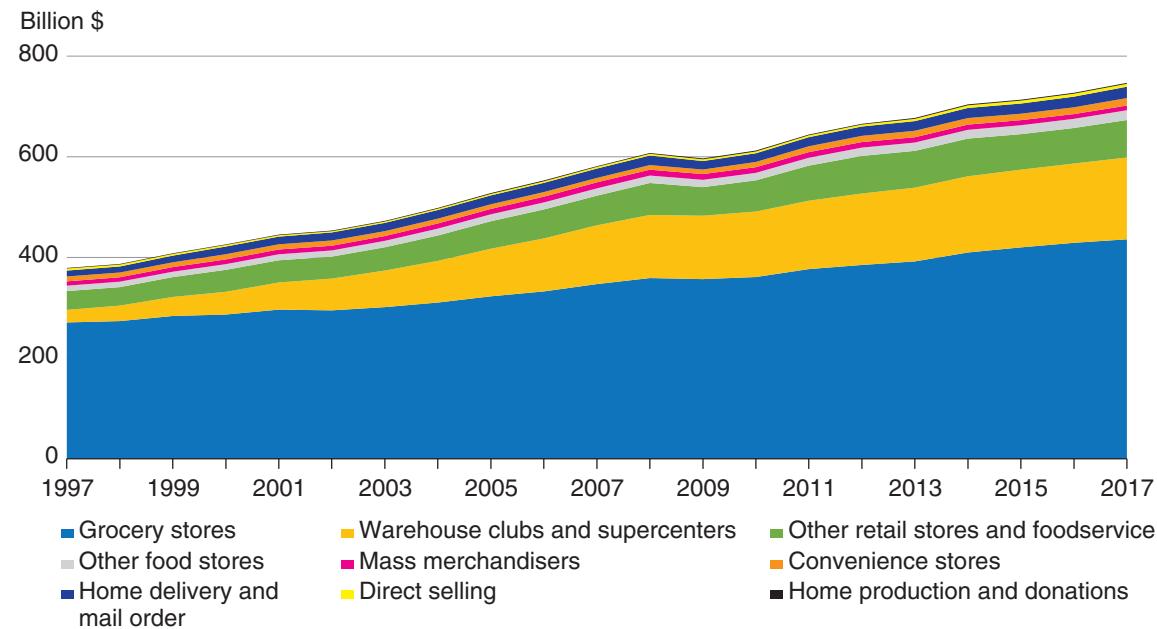
Analysis of the Comprehensive Revision of the Food Expenditure Series

Over the past three decades, the U.S. food system has changed. Americans spend more of their food budget on FAFH compared to FAH, and outlets primarily engaged in selling FAH products are looking for ways to regain some of their lost market share (Knowledge@Wharton, 2017; Browne, 2018). Within FAH, grocery stores have lost market share to warehouse clubs and supercenters, but a new wave of competition from online and discount retailers could eat into the market share of warehouse clubs and supercenters in the future (Rampoldt, 2015). Limited-service restaurants, which were hit little by the Great Recession (December 2007-June 2009), continue to increase their share of the FAFH market, with millennial consumers preferring limited-service to their full-service counterparts (Taylor, 2017). The Food Expenditure Series can be used to analyze present and long-term macroeconomic trends in U.S. food retailing and foodservice markets.

By far the largest component of FAH expenditures (with sales taxes) are sales at grocery stores (fig. 12). On average, grocery stores account for 62 percent of FAH. Nominal annual grocery store sales grew an average of 2.4 percent between 1997 and 2017, declining only twice, in 2002 and 2009, around the two most recent recessions (i.e., March 2001-November 2001 and December 2007-June 2009). However, prices at grocery stores (as measured by the CPI for FAH) have grown at an average of 2.2 percent each year. After deflating nominal grocery store sales (without taxes) by the CPI for FAH to capture the effect of prices (i.e., constant-dollar estimates), grocery store sales have largely been stagnant except for 2016 and 2017, when prices declined for the first time in several decades (fig. 13). This partially explains why the dominance of grocery stores in capturing FAH expenditures decreased consistently between 1997 and 2017 (with the exception of the Great Recession), with its share of FAH expenditures declining from 71.4 to 58.4 percent. Similarly, the shares of FAH expenditures at convenience stores, other food stores, mass merchandisers, and direct sellers (i.e., farmers, manufacturers, and wholesalers) fell steadily during this period. For these other outlets, nominal sales increased but at the same or lower rate than prices, so that constant-dollar sales stagnated or declined over the period.

Nominal year-to-year sales have been positive at most FAH outlets with the exception of declines during the two most recent recessions. However, mass merchandiser FAH sales have fallen since the most recent recession, unlike the other FAH outlets, where sales fell slightly during the most recent recession but mostly recovered after the recession. FAH sales at mass merchandiser outlets grew at an average rate of 3.5 percent between 1997 and 2007, with the exception of 2002, when food sales declined 2.2 percent. Since 2008, food sales have declined at an average rate of 2.5 percent per year. This may indicate a permanent shift in shopping patterns rather than a blip associated with the most recent recession.

Figure 12
FAH expenditures with taxes by all purchasers and outlet type, 1997-2017

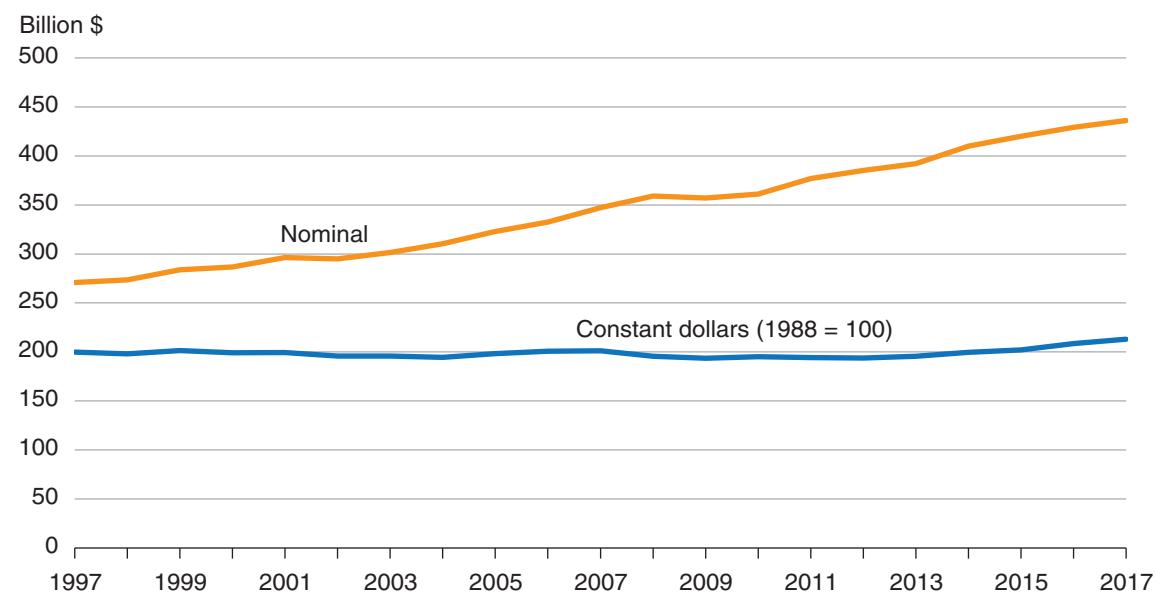


FAH = food at home.

Note: The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

Figure 13
Constant-dollar and nominal sales with taxes by all purchasers at grocery stores, 1997-2017

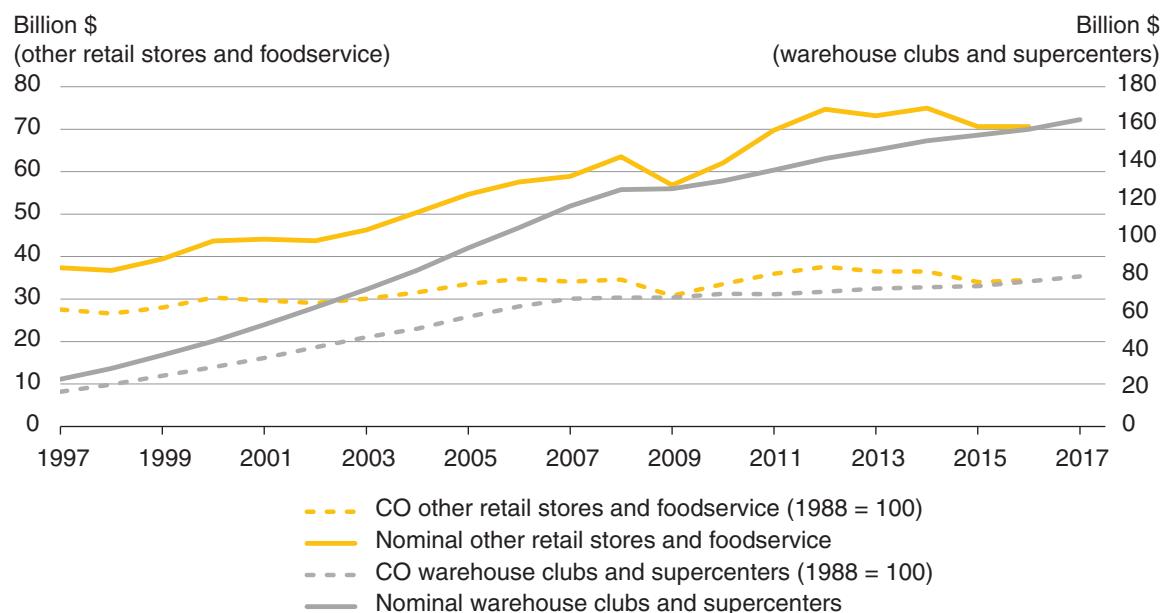


Note: The constant-dollar sales (1988=100) are nominal prices divided by the Consumer Price Index for food at home. The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

Americans are spending more on FAH from warehouse clubs and supercenters, and other retail stores and foodservice. The share of FAH from warehouse clubs and supercenters has grown from around 6.6 percent to 21.8 percent of FAH expenditures. Warehouse clubs and supercenters' nominal sales grew between 10.9 and 23.0 percent per year before the most recent recession; nominal growth dipped to 7.4 percent in 2008 and then to less than 1 percent in 2009 (fig. 14). Since the recession, nominal growth has stabilized at around 2.0 to 4.5 percent, substantially less than before the recession. The share of FAH from other retail stores and foodservice hovers around 9.5 to 11.2 percent. Nominal sales at other retail stores and foodservice grew, on average, around 4.7 percent before the most recent recession but, similar to many of the outlets in FAH, dipped in 2009. Interestingly, average FAH growth at these outlets is smaller after the recession (an average 4.7 percent before 2008, compared with an average 3.6 percent after). This is a result of declining FAH sales at other retail stores and foodservice between 2014 and 2015, and slow growth thereafter.

**Figure 14
Constant-dollar and nominal sales with taxes by all purchasers at warehouse clubs and supercenters, and other retail stores and foodservice, 1997-2017**



CO = constant dollar.

Note: The CO sales are nominal prices divided by the Consumer Price Index for food at home. The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

Mail order and home delivery expenditures (which include vending machine operators as well as e-commerce) were stable at 3.1 to 3.6 percent of FAH between 1997 and 2006, but fell to 2.8 percent in 2009 and have only regained back some of their share of the market at 3.0 percent in 2017.¹⁸ Nominal FAH sales at these outlets grew at about 3.4 percent per year on average.¹⁹

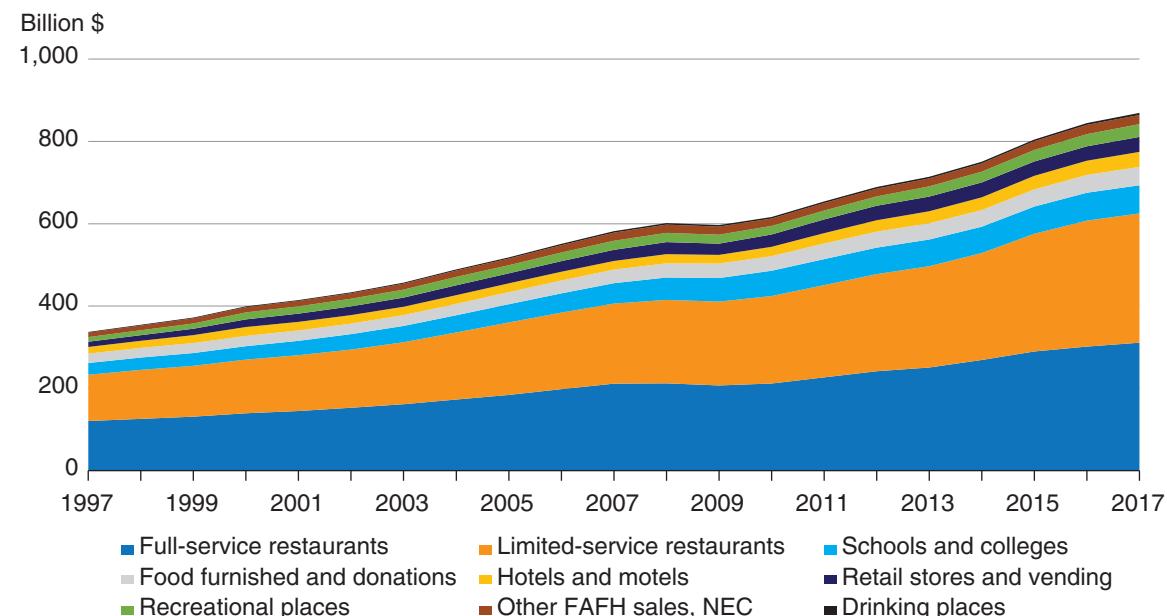
¹⁸Food and beverage stores (NAICS 4451) that also sell products online are asked to report their e-commerce sales separately, and these sales are reported in NAICS 4541—mail order and home delivery establishments. In 2015, e-commerce sales at food and beverage stores accounted for about \$1.2 billion, less than a 0.5 percent of food and beverage sales at these establishments. See the ARTS for more details.

¹⁹In 2015, e-commerce sales of food and beverages at mail order and home delivery establishments accounted for \$7 billion, about 35 percent of food and beverage sales at these establishments, up from \$235 million in 1998 (less than 1 percent of food and beverage sales in 1999).

The largest component of FAFH expenditures (with taxes and tips) consists of sales at full-service restaurants (35.3 percent on average), followed closely by sales at limited-service restaurants (33.6 percent on average) (fig. 15). Between 1997 and 2017, the share of FAFH expenditures at limited-service outlets mostly increased, but it was less than the share at full-service outlets except in 2010 and, more recently, in 2016 and 2017 (fig. 16). The share of FAFH expenditures at full-service outlets declined sharply in 2007, reaching a low in 2010, and growing thereafter until 2015.

Figure 15

FAFH expenditures with taxes and tips by all purchasers and outlet types, 1997-2017



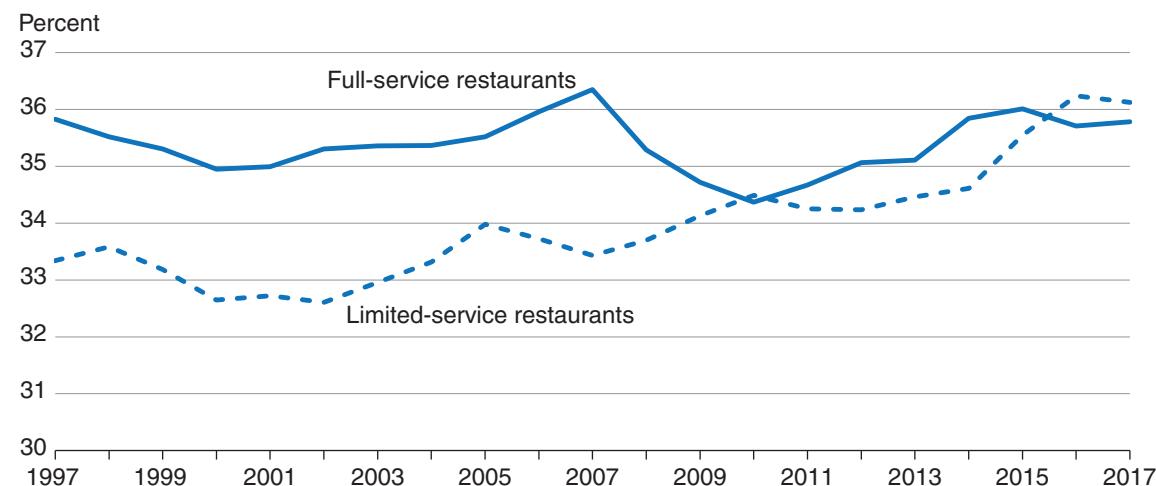
FAFH = food away from home. NEC = not elsewhere classified.

Note: The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

Figure 16

Share of FAFH expenditures with taxes and tips by all purchasers at full- and limited-service restaurants, 1997-2017



FAFH = food away from home. Note: The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

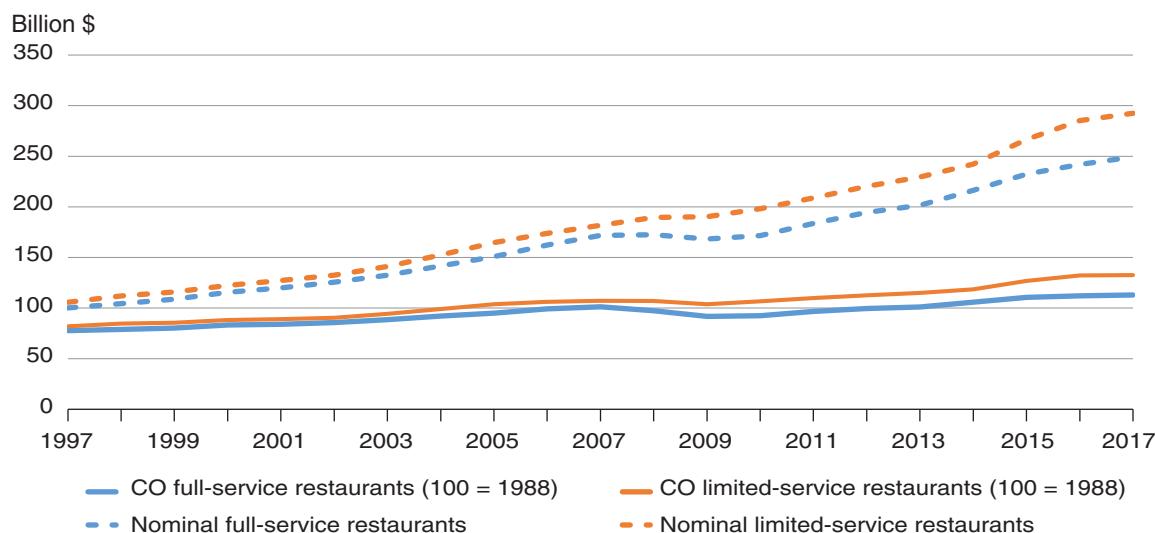
Excluding taxes and tips, sales at limited-service restaurants were greater than full-service restaurants both nominally and in constant dollars (fig. 17). Nominal sales for full- and limited-service restaurants grew an average 5.3 and 5.5 percent per year, respectively, with a slowdown in growth for limited-service restaurants and a decline in growth for full-service restaurants in 2008-09. Prices at FAFH establishments grew about 2.7 percent year to year between 1997 and 2017, but nominal sales at full- and limited-service restaurants outpaced this growth, indicating an increase in the quantity of meals and snacks produced and consumed at these outlets.

Unlike FAH, where expenditures declined during the last two recessions, FAFH at limited-service restaurants between 1997 and 2017 slowed only in the most recent recession. The nominal and constant-dollar estimates of the other FAFH outlet types follow the same general pattern as limited-service restaurants—increasing until the most recent recession, falling or remaining constant during the recession, and recovering by 2011. An exception to this general trend is food revenues at schools and colleges.

Schools and colleges constitute an average of 8.7 percent of FAFH expenditures. Nominal food revenues at schools and colleges outpaced prices until 2013. Nominal food revenues dipped between 2013 and 2014 and then picked up again (fig. 18). However, constant-dollar food revenues at schools and colleges remained flat even after nominal food revenues rebounded.

The largest category of alcohol purchases is on-premises at eating and drinking places, making up an average of 40.0 percent of all alcohol purchases between 1997 and 2017 (fig. 19). Paralleling growth in full- and limited-service restaurant shares, the share of alcohol purchases at eating and drinking places has increased from 35.7 percent in 1997 to 41.3 percent in 2017. Even after accounting for the differences that taxes and tips may play in the estimates, expenditures for alcohol away from home (AAFH) at eating and drinking places are much larger than expenditures for alcohol at home (AAH) at liquor stores. When Americans dine out, they are spending more on both alcohol and food at limited- and full-service restaurants.

**Figure 17
Constant-dollar and nominal sales without taxes or tips by all purchasers at full- and limited-service restaurants, 1997-2017**

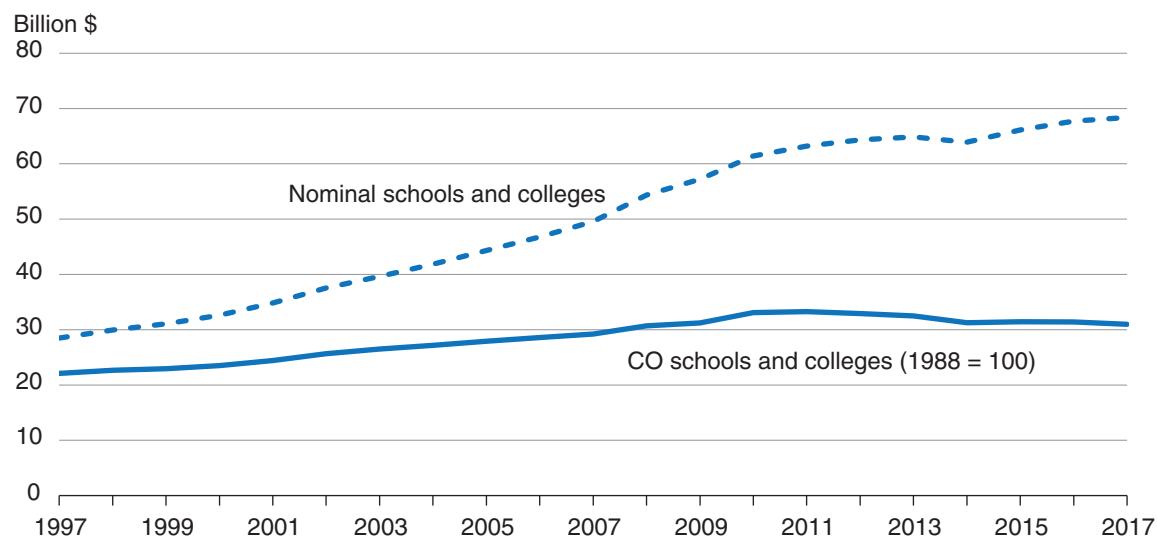


CO = constant dollar.

Note: The estimate for the 2017 Food Expenditure Series is the advance estimate. The CO sales (100 = 1988) are the nominal prices divided by the Consumer Price Index for food away from home.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

Figure 18
Constant-dollar and nominal food revenues at schools and colleges for all purchasers, 1997-2017

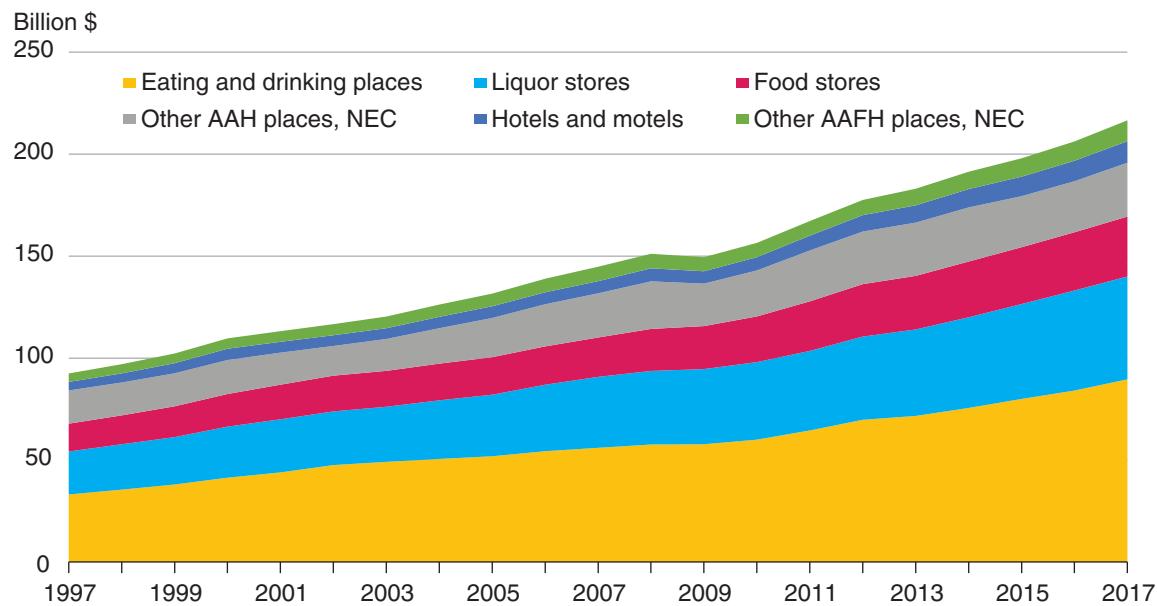


CO = constant dollar.

Note: The CO sales (1988=100) are the nominal prices divided by the Consumer Price Index for food away from home. The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

Figure 19
Alcohol beverage expenditures with taxes and tips by all purchasers and outlet types, 1997-2017



AAH = alcohol at home. AAFH = alcohol away from home. NEC = not elsewhere classified.

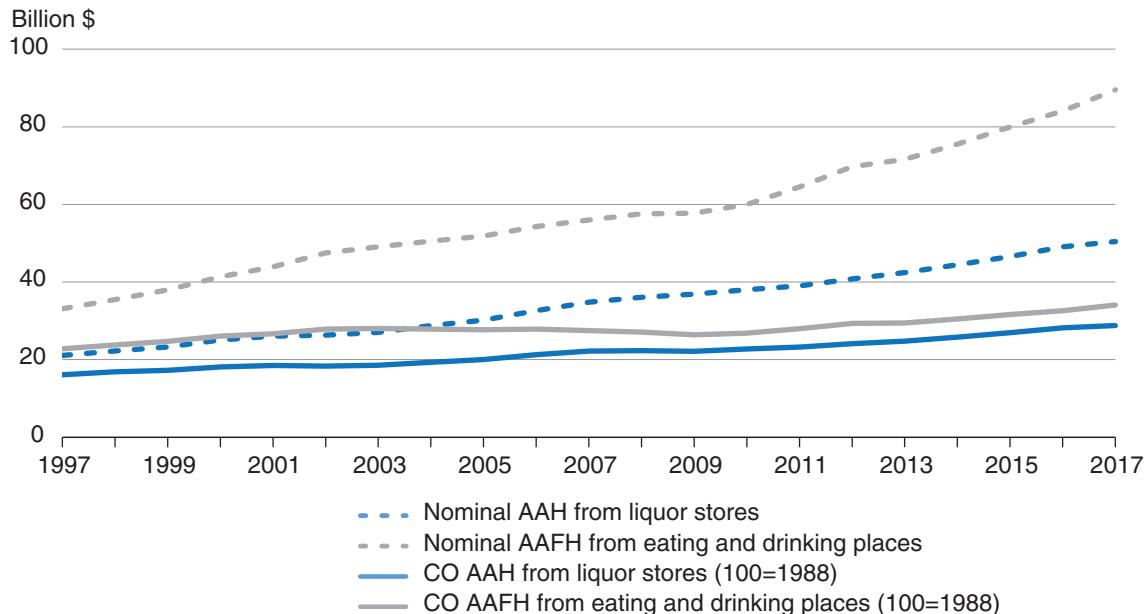
Note: The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

Purchases of AAH at liquor stores and AAFH purchased at eating and drinking places moved differently between 1997 and 2017 (fig. 20). Similar to FAH, nominal sales of AAH grew more slowly during the last recession compared to pre- and post-recession, and prices of alcohol at retail stores grew at about the same rate. So, constant-dollar AAH sales at liquor stores grew slowly between 1997 and 2007, were flat in 2008–09, and grew thereafter. Constant-dollar AAH sales at food stores and other stores showed similar trends. On the other hand, prices of AAFH began to outpace sales beginning in 2002, which led to a steady decrease in constant-dollar AAFH at eating and drinking places until 2010.

For all food and alcohol purchases, more is spent on FAH at grocery stores than any other food and alcohol outlet, but its share declined from 33.5 percent to 23.8 percent between 1997 and 2017. In 1997, full-service restaurants accounted for the second-largest food or alcohol expenditure (14.9 percent) (fig. 21). But in 2017, Americans spent a greater share of their food and alcohol budget at limited-service restaurants than at full-service outlets (17.1 percent versus 17.0 percent). Together, food sales at full- and limited-service restaurants accounted for 28.8 percent of food and alcohol expenditures in 1997. By 2007, the share spent on FAFH at restaurants was 31.0 percent compared to 26.5 percent spent on FAH at grocery stores. And by 2017, the share of total food and alcohol beverages expenditures spent on FAFH at restaurants was 34.1 percent, compared with 23.8 percent on FAH at grocery stores. The percentage of food and alcohol expenditures spent on alcohol is virtually unchanged from 1997–2017—around 2.6 to 2.8 percent for liquor stores, 4.1 to 4.9 percent for eating and drinking places, and 4.7 to 4.2 percent for all other AAH and AAFH. The increase in the share of total food and alcohol expenditures on FAFH at eating and drinking places is a function of several factors including increasing consumer income, less time available for meal preparation, the age and structure of households in the United States, advertising, and so on (see Okrent and Kumcu (2016) and Rahkovsky et al. (2018) for a more detailed explanation).

Figure 20
Nominal and constant-dollar AAH and AAFH at eating and drinking places and liquor stores with taxes and tips for all purchasers, 1997–2017

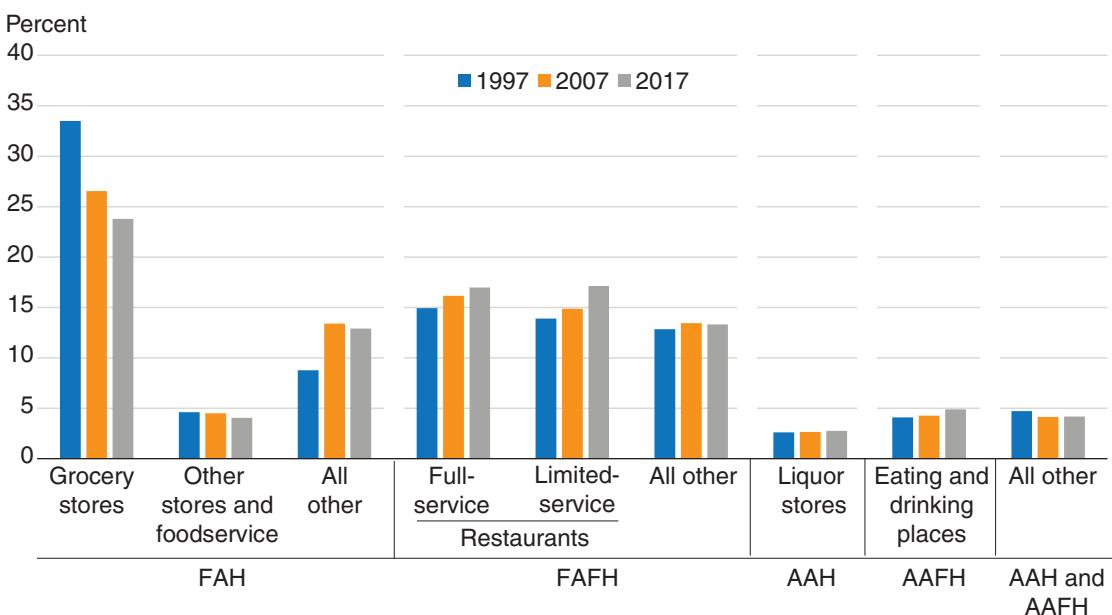


AAH = alcohol at home. AAFH = alcohol away from home. CO = constant dollar.

Note: The CO sales (100 = 1988) are nominal prices divided by the CPIs for AAH and AAFH. The estimate for the 2017 Food Expenditure Series is the advance estimate.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series.

Figure 21
Share of total food and alcohol expenditures by outlet type, selected years



FAH = food at home. FAFH = food away from home, AAH = alcohol at home, AAFH = alcohol away from home.

Note: The estimate for the 2017 Food Expenditure Series is the advance estimate. "FAH: all other" is total FAH sales less sales at grocery stores and other stores and foodservice. "FAFH: all other" is total FAFH sales less sales at full-service restaurants and limited-service restaurants. "AAH and AAFH: all other" is total AAH and AAFH sales less sales at liquor stores and eating and drinking places (see tables 3b and 3d for more details about industries included here).

Source: USDA, Economic Research Service calculations based on the comprehensive revision of the Food Expenditure Series.

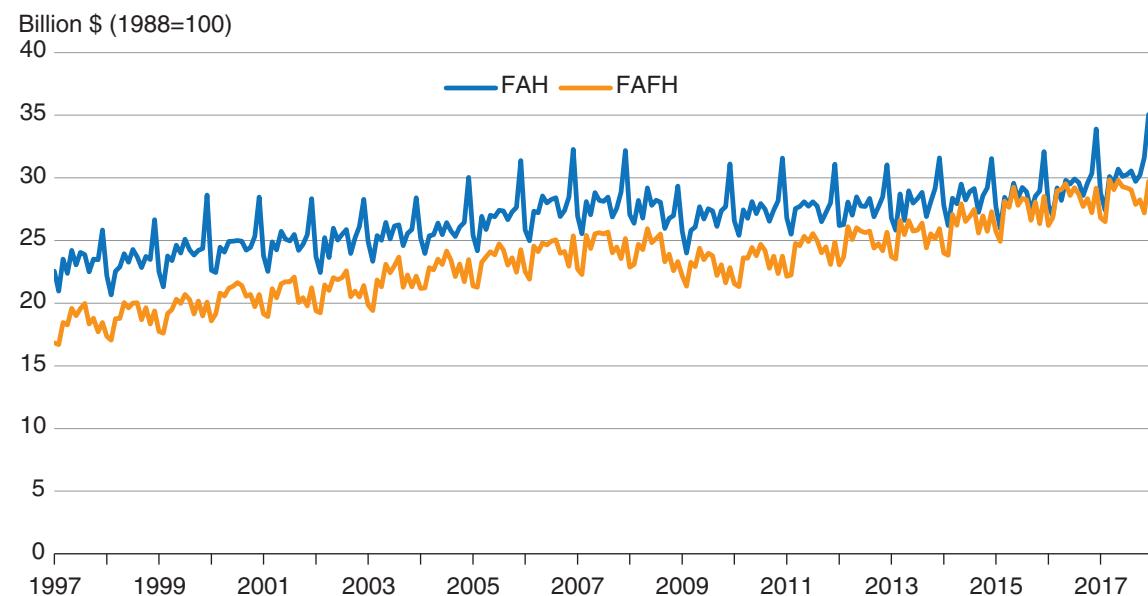
Figure 22 tracks monthly expenditures for both FAH and FAFH for 1997 through 2017.²⁰ The seasonal regularity of consumer spending patterns is apparent, with a sharp spike at the end of each year, likely reflecting the sharp increase in spending for the holidays celebrated at the end of the year, followed by a commensurate drop during the next 2 months. December sales accounted for about 9.5 percent of total annual sales for FAH, 1 percentage point higher than the months with the next highest shares, November, August, July, and May. For FAH, sales in May, July, and August made up the largest share at 8.5 percent of the annual amount. January and February shares were the lowest for both food categories. Seasonal patterns were even stronger in food sales for department stores, where November and December sales accounted for about 10.3 percent and 15.7 percent of annual food sales, respectively. These patterns also indicate that the data could be used to develop time series models to quantify the impact of seasonal factors on consumer spending patterns.

Figure 23 shows the growth rate in monthly FAH and FAFH sales, plotting the percentage change in sales for each 12-month period from January 1999 through December 2016. The volatility of FAH and FAFH sales is measured by the rolling 2-year standard deviation of the growth rate. These measures are adapted from the techniques in the macroeconomic literature to assess business cycle volatility as presented in Gordon (2005). Using constant-dollar values, FAH sales grew an average of 1.3 percent over each 12-month period, with FAFH recording a 2.3-percent change.

²⁰This discussion focuses on the constant-dollar figures, but the overall trends and the analysis with nominal values are similar to those discussed here.

Figure 22

Monthly constant-dollar sales with taxes and tips of FAH and FAFH (1988=100), 1997-2017



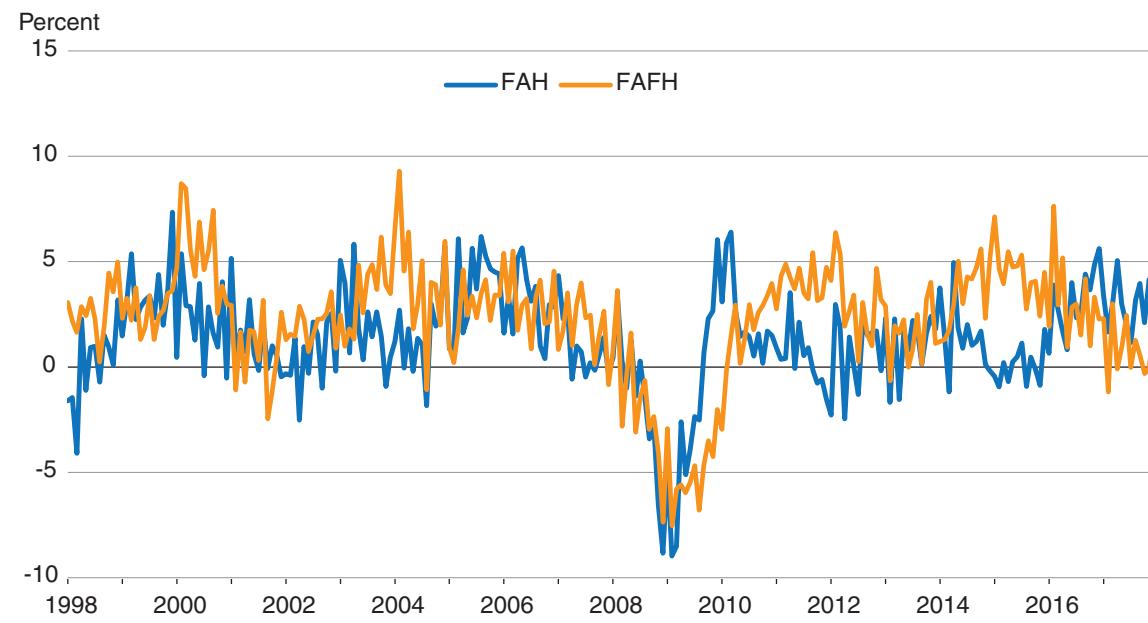
FAH = food at home. FAFH = food away from home.

Note: The constant-dollar sales (100=1988) are nominal prices divided by the Consumer Price Indexes for food at home and food away from home.

Source: USDA, Economic Research Service comprehensive revision of the Food Expenditure Series, monthly estimates.

Figure 23

Yearly percentage change in food sales with taxes and tips, month-over-month, 1997-2017



FAH = food at home. FAFH = food away from home.

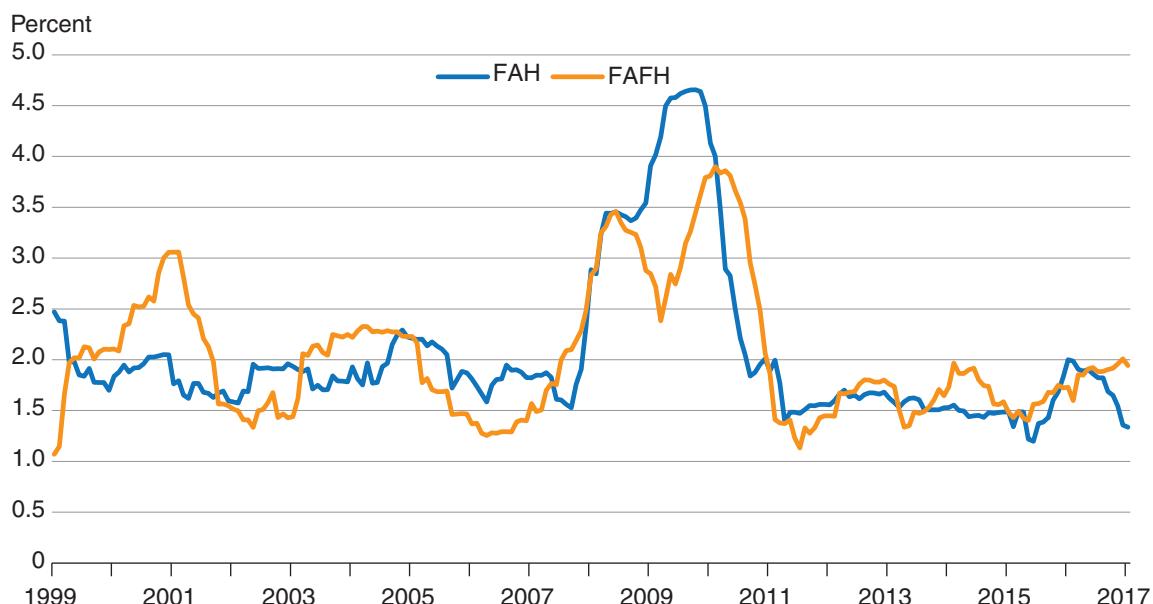
Source: USDA, Economic Research Service calculations based on the comprehensive revision of the Food Expenditure Series, monthly estimates.

The low average growth rate masks significant and extended periods of declines and increases in sales. For August 2008 through August 2009, FAH sales fell for 13 consecutive months. Sales rose for the next 20 months, with 7 months recording increases above the average growth rate over the sample period. These patterns were also apparent in FAFH, where sales fell for 21 consecutive months from June 2008 through February 2010. This decline was dwarfed by the 39-month period of increases from September 2004 through November 2007. Both FAH and FAFH showed positive growth rates for every month from December 2015 to January 2017, when growth averaged above 3.0 percent for each.

Calculating the rolling, 2-year standard deviation of the growth rate provides a measure of the volatility of sales for the two markets. FAH sales generally showed a low and slightly declining volatility except for a large jump from February 2009 through January 2011 (fig. 24). Measured by the 2-year standard deviation of the growth rates, the volatility averaged about 4.0 percent during this period, or about 93 percent higher than the average for the full sample. The volatility in FAFH sales had a more pronounced cyclical pattern, but it reached its two peak values during the same time period as FAH sales. Volatility has declined in the most recent years (2012 to 2017) for both FAH and FAFH, falling well below the average for 1997-2017.

Sales patterns reached maximum volatility following recessions. The Great Recession of 2007-09 produced the highest volatility, followed by the dot-com recession of 2001. Interestingly, the FAFH sector accounted for most of the volatility in the earlier recession. High levels of volatility were recorded for both FAH and FAFH sectors during the Great Recession, with FAH displaying the larger amount. Consumers presumably switched to FAH eating as discretionary income dropped due to the period's higher levels of unemployment.

**Figure 24
Volatility of monthly food sales, 1997-2017**



FAH = food at home. FAFH = food away from home.

Source: USDA, Economic Research Service calculations based on the comprehensive revision of the Food Expenditure Series, monthly estimates.

Conclusion

The comprehensive revision of the Food Expenditure Series strengthens the accuracy, timeliness, and reliability of the estimates and improves the transparency of the data to stakeholders. Accuracy has increased because new methods and protocols have been established to minimize analyst error in estimation, and new source data have replaced obsolete or less reliable data products. Timeliness has increased by introduction of *advance* estimates. Reliability has increased by establishment of a timetable for estimates to be released. Finally, transparency of the Food Expenditure Series has increased by reorganization of the layout of published tables and documentation of the revisions in this Technical Bulletin.

Expenditures for FAH by all purchasers (households, government, and businesses) between 1997 and 2014, were revised downward an average \$22.4 billion (-4.2 percent), and expenditures for FAFH by all purchasers were revised upward \$13.3 billion (+2.5 percent). The difference in magnitude between the previously published and comprehensive revision estimates resulted in FAFH expenditures overtaking FAH expenditures as a share of total food expenditures continuously since 2010. In previously published estimates, the share of total food expenditures allocated to FAFH overtook FAH in 2014.

The magnitude differences had little effect on distribution of expenditures by outlet type and the rate of change with a few notable exceptions. The average home production and donations and direct selling shares shrank from 3.3 percent and 7.2 percent of FAH expenditures, respectively, in the previously published estimates to less than 1 percent in the comprehensive revision. The revised and the previously published FAH and FAFH estimates mostly grew at the same rate from year to year, with the exception of direct selling by farmers, processors and wholesalers, mail order and home delivery, and other retail stores and foodservice, which had an average difference in growth between the previously published and comprehensive revision of more than 1 percentage point.

The implications of these revisions for research using these data are twofold. First, studies that used or will use the level estimates of the Food Expenditure Series will have substantial revisions across some outlet types, especially in FAH. Second, studies that used or will use the variation in the estimates (including trend analysis and forecasting) will not be much affected, with the exception of some FAH outlets noted above. Because the variation between the previously published estimates and the comprehensive revision is similar, the previously published estimates may be used to pull the comprehensive revision estimates back beyond 1997, which would enhance the series' usefulness in forecasting and trend analysis.

All of the Food Expenditure Series estimates were affected by the incorporation of the 2012 Economic Census as well as incorporation of new sales tax rates. The revisions were bigger for the FAH estimates than the FAFH estimates. Errors in estimation in the previously published series and differences in the sales tax rates account for large downward revisions in FAH grocery store sales (-\$123.4 billion, -27.2 percent) between 1997 and 2014, but the year-to-year growth did not change. Changes in the methods and source data affected the estimates for direct sellers and home production and donations the most. These methodology and source data changes resulted in most of the \$36.4 billion downward revision in direct selling by farmers, manufacturers, and wholesalers estimates, and the \$17.0 billion downward revision in home production and donations estimates. Consequently, the average share of the FAH market declined from 7.2 to 0.7 percent for direct sellers, and from 3.3 to 0.3 percent for home production and donations.

For FAFH estimates, sales at full-service restaurants were revised the most in magnitude, with an average downward revision of -\$14.4 billion (-7.7 percent) between 1997 and 2014. In terms of percent revision, other FAFH sales, NEC, and schools and colleges were the largest, with upward revisions of 41.6 and 26.9 percent, respectively. The upward revision in other FAFH sales, NEC, reflects the introduction of new source data for food sales at other establishments (e.g., food contracting in commercial office buildings, manufacturing and industrial plants, and government facilities). The upward revision of food revenues at educational institutions reflects differences in source data and methods for measuring food revenues at public elementary and secondary schools. Over time, the comprehensive revision and previously published estimates of food revenues at schools and colleges generally trend together except for the most recent years.

Most of the revised Food Expenditure Series is based on quality Census data. Significant shares of the FAH and FAFH estimates (96.7 and 78.2 percent, respectively) are based on Census data. Most of these data are also the source of the Personal Consumption Expenditures (PCE) estimates of the Bureau of Economic Analysis (BEA), which likely explains why the comprehensive revision of the household purchaser estimates in the Food Expenditure Series is the most comparable in magnitude and growth to the PCE. The Consumer Expenditures (CE) estimates published by the Bureau of Labor Statistics (BLS), on the other hand, are based on household weekly diaries, and these estimates do not as closely resemble the PCE and the Food Expenditure Series.

Based on the Food Expenditure Series and PCE, household food expenditures as a share of disposable personal income (DPI) fell slightly between 1997 and 2004 and have been somewhat stable thereafter at 10.0 percent for the Food Expenditure Series and 10.8 percent for the PCE. This is consistent with Engel's law. The share of households' total food expenditures attributable to FAFH shows an upward trend until 2007, when it fell or was flat until 2011 (although CE estimates show a decline until 2013), and has grown since. This is consistent with Bennett's law. Between 1997 and 2017, the FAFH share of households' food expenditures based on the comprehensive revision of the Food Expenditure Series is 45.7 percent, compared with 43.2 for the BEA PCE and 41.3 for the BLS CE.

Since 1997, the Food Expenditure Series shows several notable trends in the food industry, including the changing composition of where Americans purchase FAH and FAFH, and the declining FAH share of total food expenditures. On average, the grocery store share of FAH expenditures has decreased from 71.4 to 58.4 percent. While nominal grocery store sales grew an average of 2.4 percent per year between 1997 and 2017, prices at grocery stores grew at an average of 2.2 percent each year. Therefore, real grocery store sales have largely been stagnant, except for 2016 and 2017, when prices declined for the first time in several decades. The share of FAH expenditures from warehouse clubs and supercenters has grown from around 6.6 percent to 21.8 percent. Warehouse clubs and supercenters' nominal sales grew between 10.9 and 23.0 percent per year before 2008, but dipped to 7.4 percent in 2008 and then to 0.4 percent in 2009. Since 2009, nominal annual growth has stabilized to around 2.0 to 4.5 percent, substantially less than before 2009. The share of FAH from other retail stores and foodservice hovers around 9.5 to 11.2 percent. Nominal sales at other retail stores and foodservice grew an average 4.7 percent per year until 2008. After 2008, average annual growth in food sales at these outlets is an average 1.1 percentage point lower than before the recession.

The share of food expenditures allocated to FAH by all purchasers has steadily declined. In 2010, FAFH first constituted a larger share of the food market. The largest component of FAFH expenditures (with taxes and tips) is sales at full-service restaurants (35.3 percent on average), followed closely by

sales at limited-service restaurants (33.6 percent on average). The share of FAFH expenditures on full-service outlets declined sharply in 2007-2010, but began to rebound in 2011. Nominal sales for full- and limited-service restaurants grew around an average 5.3 and 5.5 percent per year, respectively, with a slowdown in growth for limited-service restaurants and a decline in growth for full-service restaurants in 2008-2009. Prices at FAFH establishments grew about 2.7 percent year to year between 1997 and 2016, but nominal sales at full- and limited-service restaurants outpaced this growth, indicating an increase in the quantity of meals and snacks produced and consumed at these outlets.

The Food Expenditure Series has a few limitations that should be kept in mind when using the data. First, the designation of food expenditures as either off- or on-premises is self-reported by employer establishments every 5 years in the Economic Census. However, it is not clear if the establishments consider the same items to be on- or off-premises. For example, is a rotisserie chicken purchased at a grocery store considered on- or off-premises? It certainly has the value-added components of an on-premises food, but it is packaged like an off-premises food. Also, these data are available only for employer establishments. The percentage breakdown of sales between on- and off-premises, and similarly for food and nonfood products, is assumed to be the same for employer and nonemployer establishments. As this information is available only every 5 years through the Economic Census; a linear relationship is assumed among the data between the quinquennial Economic Census.

A second limitation of the Food Expenditure Series is that some of the calculations are based on “back-of-the-envelope” guesses of the value of food and alcohol in the United States due to lack of representative data. This is the case for home production, direct selling by manufacturers, food furnished as part of a secondary activity, and food sold at higher education institutions. These back-of-the-envelope estimates constitute a small portion of the overall value of the Food Expenditure Series (about 3.3 percent for FAH and 21.8 percent for FAFH), but interested users should be cautious about interpretation of some of the more granular-level outlet data in their research.

A third limitation of the comprehensive revision is that it goes back only to 1997. One of the virtues of the previously published Food Expenditure Series is that it went back to the 1800s, and the comprehensive revision represents a break in the long-time series. However, given that the variation for most of the outlets between 1997 and 2014 is consistent between the comprehensive revision and previously published estimates, analyses that depend on the long-time series properties of the Food Expenditure Series should account for this in their analysis.

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List of Acronyms

- AAH alcohol at home
AAFH alcohol away from home
ACL Administration for Community Living
ASM Annual Survey of Manufactures
ARTS Annual Retail Trade Survey
AWTS Annual Wholesale Trade Survey
BEA Bureau of Economic Analysis
BLS Bureau of Labor Statistics
CACFP Child and Adult Care Food Program
CE Consumer Expenditures
CPI Consumer Price Index
DPI Disposable personal income
ERS Economic Research Service
FAH food at home
FAFH food away from home
FNS Food and Nutrition Service
MRTS Monthly Retail Trade Survey
MSIO Manufacturers' Shipments, Inventories, and Orders
MWTS Monthly Wholesale Trade Survey
NAICS North American Industry Classification System
NCES National Center for Education Statistics
NCHS National Center for Health Statistics
NEC not elsewhere classified
NHANES National Health and Nutrition Examination Survey
NSLP National School Lunch Program
PCE Personal Consumption Expenditures
PL Product Lines
PPI Producer Price Index
QSS Quarterly Services Survey
SAS Service Annual Survey
SBP School Breakfast Program
SIPP Survey of Income and Program Participation
SNAP Supplemental Nutrition Assistance Program
TEFAP The Emergency Food Assistance Program
USDA U.S. Department of Agriculture
WIC Special Supplemental Nutrition Program for Women, Infants, and Children

Appendix

Table A1a
PL to categorize food sales into at-home and away-from-home sales: 1997 Economic Census

	PL code	PL description (NAICS)
Food at home	100	Grocery and other food items for off premise (44/45, 72)
	4100	Frozen packaged foods (4224)
	4200	Dairy products (excluding canned and dried) (4224)
	4300	Poultry and poultry products (4224)
	4400	Confectionary (4224)
	4500	Fish and seafood (4224)
	4600	Meat and meat products (4224)
	4700	Fresh fruits and vegetables (4224)
	4800	Coffee, tea, and spices (4224)
	4820	Bread and baked goods (4224)
	4830	Canned foods (4224)
	4840	Food and beverage basic materials (4224)
	4850	Soft drinks and bottled water (4224)
	4860	Other grocery specialties (4224)
	4900	Grains and beans (4224)
Food away from home	120	Meals & unpackaged snacks prepared for consumption on premises (44/45, 72)
	121	Food/nonalcoholic beverages for carry-out & consumption off premises (72)
	122	Food/nonalcoholic beverages prepared for consumption on premises (72)
	8500	Sales of food and beverage (51, 71, 81)
	8501	Sales of food (71, 81)
Alcohol at home	140	Packaged beer, wine, liquor (44/45, 72)
	5600	Beer (4244)
	5700	Wine and distilled spirits (5700)
Alcohol away from home	130	Alcohol for on-premises consumption (44/45, 72)
	8502	Sales of alcoholic beverages (71, 81)

PL = product line. NAICS = North American Industry Classification System.

Source: U.S. Census Bureau (2017).

Table A1b
PL to categorize food sales into at-home and away-from-home sales: 2002 Economic Census

	PL code	PL description (applicable NAICS sector or subsectors)
Food at home	20100	Grocery and other food items for off premise (44/45, 72)
	14100	Frozen packaged foods (4244)
	14200	Dairy products (excluding canned and dried) (4244)
	14300	Poultry and poultry products (4244)
	14400	Confectionary (4244)
	14500	Fish and seafood (4244)
	14600	Meat and meat products (4244)
	14700	Fresh fruits and vegetables (4244)
	14800	Coffee, tea, and spices (4244)
	14820	Bread and baked goods (4244)
	14830	Canned foods (4244)
	14840	Food and beverage basic materials (4244)
	14850	Soft drinks and bottled water (4244)
	14860	Other grocery specialties (4244)
	14900	Grains and beans (4244)
Food away from home	20120	Meals & unpackaged snacks prepared for immediate consumption (44/45, 72)
	20121	Food/nonalcoholic beverages for carry-out & consumption off premises (72)
	20122	Food/nonalcoholic beverages prepared for consumption on premises (72)
	39000	Sales of food and beverage (51, 71, 81)
	39201	Sales of food (71, 81)
Alcohol at home	20140	Packaged beer, wine, liquor (44/45, 72)
	15600	Beer (4244)
	15700	Wine and distilled spirits (4244)
Alcohol away from home	20130	Alcohol for on-premises consumption (44/45, 72)
	39202	Sales of alcoholic beverages (71, 81)

PL = product line. NAICS = North American Industry Classification System.

Source: U.S. Census Bureau (2017).

Table A1c

PL to categorize food sales into at-home and away-from-home sales: 2007 Economic Census

	PL code	PL description (NAICS)
Food at home	20100	Grocery and other food items for off premise (44/45, 72)
	14100	Frozen packaged foods (4244)
	14200	Dairy products (excluding canned and dried) (4244)
	14300	Poultry and poultry products (4244)
	14400	Confectionary (4244)
	14500	Fish and seafood (4244)
	14600	Meat and meat products (4244)
	14700	Fresh fruits and vegetables (4244)
	14800	Coffee, tea, and spices (4244)
	14820	Bread and baked goods (4244)
	14830	Canned foods (4244)
	14850	Soft drinks and bottled water (4244)
	14870	Food and beverage basic materials (4244)
	14880	Grocery specialties (4244)
	14900	Grains and beans (4244)
Food away from home	21100	Meals & unpackaged snacks prepared for immediate consumption (44/45, 72)
	21101	Meals & snacks served by server (72)
	21102	Nonalcoholic beverages served by server (72)
	21103	Meals & snacks dispensed without server (72)
	21104	Nonalcoholic beverages dispensed without server (72)
	21105	Meals & snacks dispensed via drive-through service (72)
	21106	Nonalcoholic beverages dispensed via drive-through (72)
	21107	Meals & snacks prepared for immediate consumption off premises (72)
	21108	Nonalcoholic beverages prepared for immediate consumption off premises (72)
	21112	Meals and snacks dispensed via mobile vending service (72)
	21113	Meals and snacks dispensed via mobile vending service (72)
	21211	Meals, snacks and nonalcoholic beverages under long-term contract for transit (72)
	21212	Meals, snacks and nonalcoholic beverages under long-term contract for non-transit (72)
	21220	Meals, snacks and beverages prepared for catered events (44)
	21221	Meals, snacks and nonalcoholic beverages served at catered events at caterer's premises (72)
	21222	Meals, snacks and nonalcoholic beverages served at catered events away from caterer's premises (72)
	21223	Meals, snacks and nonalcoholic beverages served at catered events dropped off at customer's event (72)
	21224	Meals, snacks and nonalcoholic beverages served at catered events picked up by customer (72)
	39460	Meals and beverages prepared and served or dispensed for immediate consumption
	39461	Meals and nonalcoholic beverage for immediate consumption
	39609	Resale of merchandise—Packaged food and beverages (51, 71)
	39679	Resale of merchandise—Packaged food and beverages (81)
Alcohol at home	20140	Packaged beer, wine, liquor (44/45, 72)
	15600	Beer (4244)
	15700	Wine and distilled spirits (4244)
Alcohol away from home	20130	Alcohol for on-premises consumption (44/45, 72)
	39462	Alcoholic beverages for immediate consumption (71, 81)

PL = product line. NAICS = North American Industry Classification System.

Source: U.S. Census Bureau (2017).

Table A1d
PL to categorize food sales into at-home and away-from-home sales: 2012 Economic Census

	PL code	PL description (NAICS)
Food at home	20100	Grocery and other food items for off premise (44/45, 72)
	14100	Frozen packaged foods (4244)
	14200	Dairy products (excluding canned and dried) (4244)
	14300	Poultry and poultry products (4244)
	14400	Confectionary (4244)
	14500	Fish and seafood (4244)
	14600	Meat and meat products (4244)
	14700	Fresh fruits and vegetables (4244)
	14800	Coffee, tea, and spices (4244)
	14820	Bread and baked goods (4244)
	14830	Canned foods (4244)
	14850	Soft drinks and bottled water (4244)
	14870	Food and beverage basic materials (4244)
	14880	Grocery specialties (4244)
	14900	Grains and beans (4244)
Food away from home	21100	Meals & unpackaged snacks prepared for immediate consumption (44/45, 72)
	21101	Meals & snacks served by server (72)
	21102	Nonalcoholic beverages served by server (72)
	21103	Meals & snacks dispensed without server (72)
	21104	Nonalcoholic beverages dispensed without server (72)
	21105	Meals & snacks dispensed via drive-through service (72)
	21106	Nonalcoholic beverages dispensed via drive-through (72)
	21107	Meals & snacks prepared for immediate consumption off premises (72)
	21108	Nonalcoholic beverages prepared for immediate consumption off premises (72)
	21112	Meals and snacks dispensed via mobile vending service (72)
	21113	Meals and snacks dispensed via mobile vending service (72)
	21213	Meals, snacks and nonalcoholic beverages under long-term contract for transit (72)
	21214	Meals, snacks and nonalcoholic beverages under long-term contract for non-transit (72)
	21215	Alcoholic beverage prepared under long-term contract (72)
	21220	Meals, snacks and beverages prepared for catered events (44)
	21225	Meals, snacks and nonalcoholic beverages served at catered events at caterer's premises (72)
	21226	Meals, snacks and nonalcoholic beverages served at catered events away from caterer's premises (72)
	21227	Meals, snacks and nonalcoholic beverages served at catered events dropped off at customer's event (72)
	21228	Meals, snacks and nonalcoholic beverages served at catered events picked up by customer (72)
	39460	Meals and beverages prepared and served or dispensed for immediate consumption (71, 81)
	39461	Meals and nonalcoholic beverage for immediate consumption (71, 81)
	39609	Resale of merchandise—Packaged food and beverages (51, 71)
	39679	Resale of merchandise—Packaged food and beverages (81)
Alcohol at home	20140	Packaged beer, wine, liquor (44/45, 72)
	15600	Beer (4244)
	15700	Wine and distilled spirits (4244)
Alcohol away from home	20130	Alcohol for on-premises consumption (44/45, 72)
	21229	Alcohol prepared for catered events (72)
	39462	Alcoholic beverages for immediate consumption (71, 81)

PL = product line. NAICS = North American Industry Classification System.

Source: U.S. Census Bureau (2017).

Table A2

Regression results for quarterly sales in the Quarterly Services Survey

NAICS	Q2	Q3	Q4	Trend	Annual sales	Constant	R2	BG test
512	640.57 (382.86)	-87.36 (384.99)	3511.22 (388.50)	-31.91 (23.33)	0.96 (0.28)	11094.75 (2632.17)	0.77	12.98 [0.00]
6114	245.01 (420.30)	-97.97 (440.39)	54.04 (471.96)	-104.51 (75.91)	1.53 (0.82)	-6644.80 (4076.93)	0.29	2.85 [0.09]
6115	-59.67 (71.34)	117.50 (72.27)	85.00 (73.80)	0.00 (6.69)	0.25 (0.10)	-35.71 (994.87)	0.62	0.08 [0.78]
6116	835.18 (198.76)	221.74 (292.98)	129.84 (427.62)	-34.85 (144.66)	0.35 (0.44)	72.63 (1049.58)	0.93	0.08 [0.78]
622	2178.39 (954.37)	525.41 (1188.64)	5185.78 (1518)	99.25 (409.07)	0.24 (0.04)	2064.72 (14262.62)	1.00	0.03 [0.86]
623	754.61 (198.7)	991.95 (221.91)	1829.28 (260.52)	21.39 (57.04)	0.24 (0.03)	241.98 (3037.29)	0.99	0.15 [0.70]
7111	284.71 (78.21)	370.57 (78.64)	870.00 (79.35)	0.00 (4.74)	0.25 (0.07)	-381.32 (873.31)	0.87	0.71 [0.40]
7112	1980.71 (305.83)	3866.86 (316.49)	3898.86 (333.5)	0.00 (47.02)	0.25 (0.13)	-2436.61 (1821.59)	0.93	0.21 [0.65]
7113	624.43 (128.14)	1071.14 (132.67)	596.43 (139.89)	0.00 (19.85)	0.25 (0.05)	-573.00 (378.66)	0.94	0.00 [0.99]
7114	97.86 (41.07)	138.71 (42.87)	386.00 (45.70)	0.00 (7.08)	0.25 (0.08)	-155.64 (140.05)	0.92	0.30 [0.59]
7115	-88.57 (89.58)	-49.29 (95.75)	702.86 (105.24)	0.00 (19.53)	0.25 (0.1)	-141.25 (405.14)	0.92	0.10 [0.76]
712	727.68 (95.88)	509.36 (96.49)	932.04 (97.48)	-4.54 (6.22)	0.25 (0.04)	-589.82 (427.61)	0.88	1.01 [0.32]
7131	1456.29 (71.52)	2368.29 (75.96)	602.57 (82.84)	0.00 (14.78)	0.25 (0.06)	-1106.79 (205.87)	0.99	0.82 [0.36]
7132	-60.57 (94.08)	-203.14 (97.27)	-340.86 (102.36)	0.00 (14.26)	0.25 (0.07)	151.14 (1035.33)	0.88	0.10 [0.75]
7139	1169.57 (300.49)	411.57 (321.58)	-948.86 (353.96)	0.00 (66.14)	0.25 (0.11)	-158.07 (3063.72)	0.90	0.95 [0.33]
7211	6774.45 (483.98)	10330.46 (811.93)	6968.90 (1212.36)	-1405.45 (412.69)	0.70 (0.14)	-3889.03 (1903.02)	1.00	0.01 [0.93]
7212	621.91 (60.61)	788.42 (64.09)	-88.67 (79.73)	-13.91 (23.41)	0.45 (0.42)	-554.48 (830.17)	0.98	0.59 [0.44]
7213	-57.16 (15.83)	59.34 (14.98)	8.43 (15.63)	-2.84 (2.50)	0.30 (0.17)	7.01 (179.19)	0.89	0.05 [0.82]
8111	1022.29 (213.86)	917.71 (274.04)	-2.14 (352.18)	0.00 (98.93)	0.25 (0.09)	-484.46 (2486.77)	0.98	0.68 [0.41]
813	-2421.43 (1867.70)	-1379.43 (2248.08)	9907.29 (2768.24)	0.00 (722.40)	0.25 (0.22)	-1526.61 (4811.99)	0.89	4.44 [0.04]

Q2-Q4 = quarters 2-4. BG = Breusch-Godfrey. Note: Standard errors in parenthesis and p-values in brackets.

Source: USDA, Economic Research Service calculations based on the Quarterly Services Survey (U.S. Census Bureau, 2018f) and Service Annual Survey (U.S. Census Bureau, 2018j).