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March 2017

Store Formats and Patterns in Household Grocery Purchases

Richard Volpe, Annemarie Kuhns, and Ted Jaenicke

United States Department of Agriculture

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Store Formats and Patterns in Household Grocery Purchases

Richard Volpe, Annemarie Kuhns, and Ted Jaenicke

Abstract

This study uses Information Resources, Inc., Household Panel dataset of comprehensive grocery purchase records to investigate relationships among store formats, household demographics, and the healthfulness of grocery purchases. The findings demonstrate that U.S. consumers increasingly shop at nontraditional store formats for their groceries, including supercenters and dollar stores (and other smaller formats), and discuss some possible implications of these changing patterns. Grocery purchases vary considerably, on average, across store formats. Households purchase the most healthful foods at supermarkets and club stores and the least healthful foods at drug stores, convenience stores, and dollar stores. In most cases, the strongest associations with respect to formats and food choices are found for low-income households.

Keywords: store formats, food at home, FAH, groceries, supermarket, club store, convenience store, drug store, dollar store, Information Resources Inc. Household Panel, *Low-Cost, Moderate-Cost, and Liberal Food Plans*

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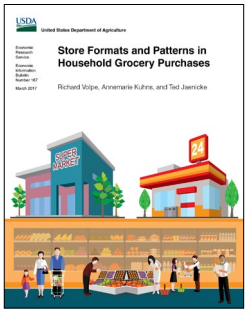
A report summary from the Economic Research Service March 2017



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Store Formats and Patterns in Household Grocery Purchases

Richard Volpe, Annemarie Kuhns, and Ted Jaenicke

What Is the Issue?

Americans are buying more and more of their "food at home," or groceries, from stores that are not conventional supermarkets. According to Nielsen Homescan data, U.S. households spent 80 percent of their grocery dollars at traditional supermarkets in 1999 but only 62 percent there in 2010. Over the past 20 years, a number of nontraditional store formats—including supercenters (such as Wal-Mart), dollar stores, and club stores—have gained market share and prominence in the food retail landscape. Whether traditional or nontraditional, store formats differ in prices, product assortment, advertising strategies, and location, and each of these characteristics can affect consumers' food choices. This report broadly outlines the associations between store format choices and food-purchasing decisions, accounting for the role of demographics.

What Did the Study Find?

The selection of healthful food available to consumers varies considerably by store format. Likewise, shopping at particular store formats can influence how well consumers' food purchases align with optimal expenditure shares for various food groups, suggestive of a healthy diet.

- Demographics, particularly income levels, correlate with shopping at particular store formats. Low-income consumers are more likely than high-income consumers are to shop for groceries at supercenters, convenience stores, and dollar stores. In contrast, high-income consumers are more likely to shop at conventional supermarkets and club stores.
- U.S. households deviate widely from food expenditure recommendations with respect to their grocery purchases, on average. This divergence holds true across demographics and store formats.
- Expenditures on fruits, vegetables, whole grains, and lean protein sources are highest at supermarkets and club stores, and lowest at convenience stores, drug stores, and dollar stores.
- The store formats at which consumers shop influence what they purchase. Supermarkets and club stores positively correlate with higher dietary quality of groceries (fresh fruits, vegetables, etc.). On the other hand, convenience stores—the nearest retail food store for many

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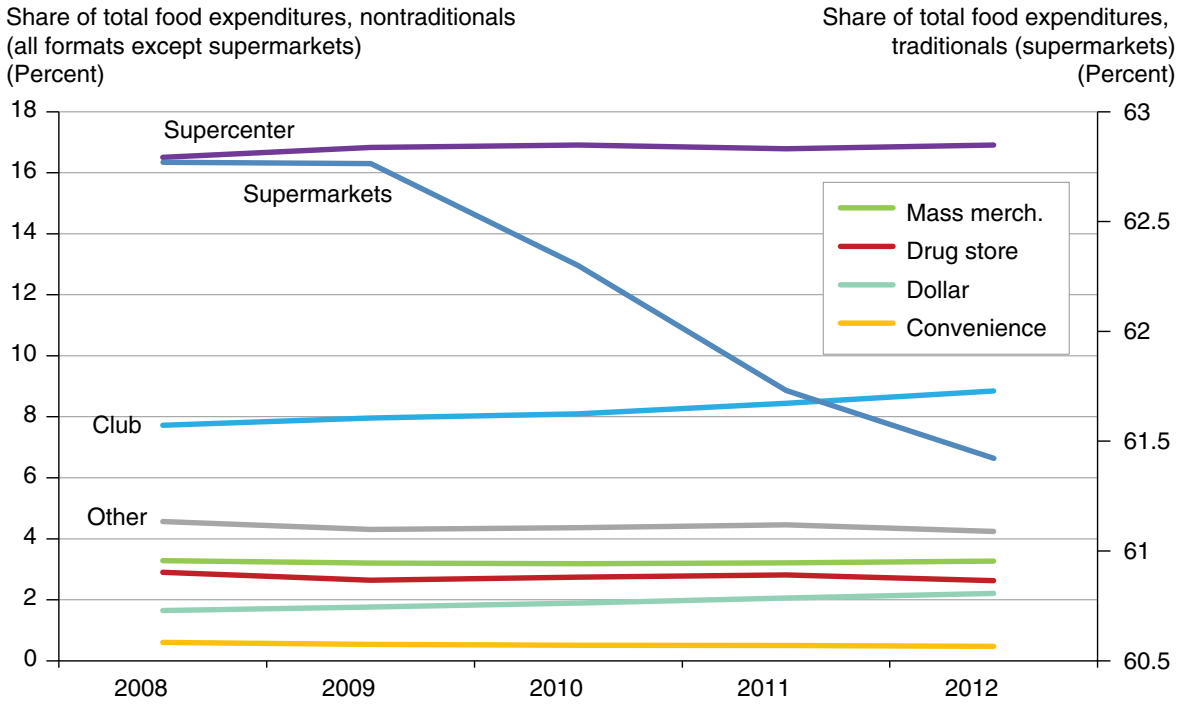
households in dense urban environments—and dollar stores correlate negatively with the purchase of healthful food. In general, these correlations are weak, but in both directions (toward more healthful and less healthful), they tend to be strongest for low-income households and weakest for high-income households.

Share of food-at-home expenditures, by store format, 2008-12



Note: Mass merch = mass merchandiser.
Source: USDA, Economic Research Service calculations using Information Resources, Inc., Household Panel data, 2008-12.

How Was the Study Conducted?

The Information Resources, Inc. (IRI) Household Panel dataset, 2008-12 used here consists of comprehensive food-at-home purchase records. The sample includes approximately 116,000 households and is intended to represent the U.S. population. The panel provides rich household-level demographics and allows purchases to be sorted by store format. The healthfulness measure used in this study is informed by the *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007) expenditure shares from USDA's Center for Nutrition Policy and Promotion as well as the USDA 2005 Healthy Eating Index. Overall diet quality is measured with a metric recently developed by ERS researchers.

Store Formats and Patterns in Household Grocery Purchases

Introduction

U.S. consumers have a number of choices beyond the conventional supermarket when shopping for groceries, as the U.S. food retail landscape grows increasingly diverse. Newer store formats, such as supercenters and club stores, have proliferated in recent decades. Meanwhile, other longstanding merchants, such as convenience stores and dollar stores, are expanding their food offerings to better attract grocery shoppers.

A great deal of research has investigated the role that food access plays in food insecurity, malnutrition, and fruit and vegetable consumption, among other concerns. A number of studies have concluded that proximity to conventional supermarkets is important, which helps explain why dietary quality issues tend to be most prevalent in very urban and very rural areas (Bustillos et al., 2008; Powell and Bao, 2009; Rose and Richards, 2004), because these areas tend to have less access to conventional supermarkets. Regarding consumers in low-income, low-access areas who are able to travel and thereby access more selection—one study observes that the farther these consumers travel, the more fruits, vegetables, fish, and poultry they purchase (e.g., Rahkovsky and Snyder, 2015). Conversely, newer research finds that store proximity does not play a major role in the dietary quality of foods households consume (Ver Ploeg and Rahkovsky, 2016). In fact, one study finds that new market entry of supermarkets does not alter dietary quality or lower rates of obesity (Cummins et al., 2014).

However, today's food retail environment is considerably more nuanced than a stark comparison between large supermarkets and small corner stores, and more work is needed to understand the role store format plays in dietary quality in America.

In the short run, some Americans' food-purchasing decisions may be influenced by the food offerings of the store formats at which they shop. In the long run, their buying decisions may respond to changes to market concentration and the store formats they have access to, as well as to changes in the formats themselves. Plenty of evidence demonstrates that prices often vary across formats, even for identical items (Basker and Noel, 2009; Leibtag et al., 2010; Volpe and Lavoie, 2008), and of course, although prices are not the only factor, they can sway buying decisions somewhat (Todd and Lin, 2012). Furthermore, different competitive strategies among different store formats may influence consumers' values when shopping. For example, especially in the past, supercenters have emphasized low prices and one-stop shopping above attributes such as product quality (Matsa, 2011; Seiders et al., 2000), whereas supermarkets often emphasize service and quality. Other influences on consumers' buying decisions may come from new offerings (particularly from convenience stores, dollar stores, and supercenters) to appeal to consumer demand for healthier options, as well as from technological changes to the retail food industry.

Other studies (e.g., Volpe and Okrent, 2012) have measured the healthfulness of consumers' food-purchasing decisions and searched for meaningful differences based on household demographics. We focus on the relationship between the stores where people shop and the extent to which their grocery purchases adhere to expenditure shares informed by the *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007) from USDA's Center for Nutrition Policy and Promotion. To conduct our research, we apply the healthfulness metrics devised by Volpe and Okrent (2012) to monthly shopping baskets for a large nationwide sample of households, as recorded in the Information Resources, Inc.'s (IRI) Consumer Network data (henceforth referred to as the IRI panel).[1] We examine the effect of store format on the healthfulness of food purchases and also consider the effect of demographics, geographic location, and other factors.

[1] Volpe and Okrent (2012) use the Nielsen household dataset. The IRI Household Panel uses many of the same households as the Nielsen Homescan data; however, not all households are included in both datasets. It is comparable in geographic coverage to the Homescan data and is operated under the same set of rules and mechanisms.

Defining Store Formats

Defining the store formats where consumers purchase food is challenging. Part of the challenge is that terminology varies among researchers and organizations, and in most cases, there is no universally accepted classification of a given store format. This situation forces researchers, particularly when relying on different data sources, to use inconsistent definitions. Additionally, several formats themselves have evolved over time or exhibit considerable variation across chains.

The Food Institute (2010) thoroughly describes each store format, as summarized in table 1. Our definitions are drawn from a consensus of definitions from Progressive Grocer and the consultancy Willard Bishop, as used by the Food Institute, as well as Nielsen and the U.S. Census for retail. In reviewing the definitions of nontraditional formats, it is important to keep in mind that the precise definitions and terminology vary across research in scholarly journals, trade publications, and the popular press. In the bulk of research on food markets, including ERS research reports, the grocery (or supermarket) format comprises what are commonly referred to as "traditional" food retailers, while all of the other channels are "nontraditional" (Besharov et al., 2011; Leibtag et al., 2010).

Supermarkets. A traditional supermarket is a food retailer with greater than 9,000 square feet of selling space and at least $2 million in annual sales. In addition, nonfood sales must account for 15 percent or less of total store sales. More than 40,000 supermarkets operate in the United States, making them more numerous than any other format besides convenience stores. Kroger is the largest U.S. supermarket chain today in terms of receipts (Supermarket News, 2011). Safeway and Publix are other prominent chains.

Table 1
Descriptive statistics of store characteristics, by format

Store format	Average number of stores per chain	Annual sales (million dollars)[c]	Average area per store (thousand square feet)	Number of cash registers at average location
Supermarket	211	14.3	28	8
Drug/convenience[a]	89	2.4	2	N/A
Mass merchandiser	444	18.9	29	13
Supercenter	484	46.6	61	26
Dollar store	484	1.4	8	N/A
Club store	450	76.9	12	N/A
Other[b]	126	6.0	12	N/A

[a] Our Nielsen TDLinx data do not include drug stores, and therefore, these statistics represent only the convenience channel. However, the store format definitions from Progressive Grocer, Food Marketing Institute, and other sources indicate that drug stores and convenience stores share many similarities. The total count in this case should only be considered to account for convenience stores.
[b] The Other category reports the average summary statistics for the combined subchannels of limited assortment supermarkets, warehouse grocery stores, natural/health stores, and superettes. These are the TDLinx retail channels that do not fit in the defined IRI store categories. It is likely that these statistics do not represent the precise contents of the IRI Other category.
[c] The sales figures for the Supermarket and Supercenter categories reflect food only. However, for all other categories, "annual sales" includes all sales.
Source: USDA, Economic Research Service calculations using Nielsen TDLinx data.

Drug Stores. Drug stores feature prescription-based pharmacies but generate at least 20 percent of their total sales from other categories, including general merchandise and food. Therefore, this category includes widespread chains such as CVS, Walgreens, and Rite-Aid but does not include stores or pharmacies, such as the Vitamin Shoppe, that sell prescriptions and other drugs or supplements while offering little if any food. Drug stores are considerably smaller, though much more numerous, than supermarkets.

Mass Merchandisers. These are large department stores that sell primarily general merchandise and nonperishables but also carry limited assortments of grocery products. Typically, these stores carry few or no perishable foods such as produce or fresh meat. Common examples of these stores include conventional Wal-Mart, Target, and K-Mart stores. This format has declined in the past decade in terms of household penetration, as measured by the share of U.S. households that patronize it for food at home (FAH). However, the decline may be mostly because many of these stores are being converted to supercenters across the country, a trend noted by Holmes (2011) as well as Singh et al. (2006).

Supercenters. Also known as hypermarkets, superstores, and (erroneously) warehouse stores, supercenters are the largest format, in terms of both square footage and product volume. Of all the formats, supercenters have also seen the largest increase in market share since 2001 and, as this study demonstrates, the greatest increase in the dollar share of FAH expenditures. Supercenters are hybrid stores that combine mass merchandisers with full supermarkets. These stores have a reputation among consumers for stressing low prices and convenience over consumer service (Carpenter and Moore, 2006). The most abundant example of this format—and the one receiving the most attention in academic literature and the press—is the Wal-Mart Supercenter. However, this study examines supercenters as a format, which also includes similar hybrid stores from Target and K-mart, as well as those of older chains such as Meijer and Fred Meyer.

Convenience Stores. These are the smallest of the major retail formats in terms of size and product offerings, but they are the most numerous by a wide margin. Convenience stores typically sell gasoline, but do not need to sell gas to be included in the category. These stores feature a limited selection of staple foods as well as ready-to-eat, prepared foods (e.g., hot dogs). Additionally, they sell general merchandise and, in many locations, alcohol and tobacco. Prominent examples of convenience stores include the small stores accompanying Exxon, Mobil, Shell, and am/pm gas stations, as well as 7-Eleven and Circle K.

Dollar Stores. These range substantially in size and product variety, but they typically emphasize low prices and offer little in the way of customer service. Many products in these stores cost one dollar. Dollar stores have surged in food sales in recent years. Traditionally, they focused on staple consumer goods and other nonfood items but, in the past decade, have increasingly offered food. Given that many items in these stores cost one dollar, regardless of size or product category, these stores offer many packaged food items at low prices relative to other formats. Willard Bishop estimates that U.S. dollar stores today generate between 20 and 66 percent of their total receipts from food sales (Fry, 2015). The three largest chains of dollar stores are Dollar General, Dollar Tree, and Family Dollar.

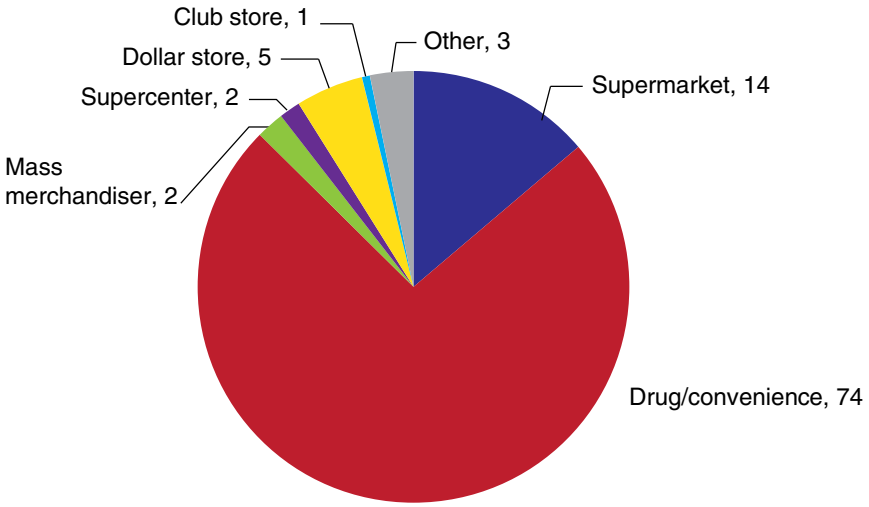
Club Stores. Also referred to as warehouse or volume stores, these are large-format outlets that specialize in selling food and selected general merchandise. The grocery line features foods and beverages in bulk for relatively low prices, per unit. A feature of this format unique in food retailing is that consumers need paid memberships to shop at them. Club stores feature limited customer

service, similar to low-margin supermarkets that also operate in warehouses (Food Institute, 2010). The most numerous example of these stores is Costco, which is the third-largest U.S. food retailer in terms of sales (*Supermarket News*, 2011). Other club store chains include Wal-Mart, Sam's Club, and BJ's.

Other. This final category is an amalgam of smaller formats, defined by IRI. This category is relatively small in terms of total consumer food spending. It consists primarily of military commissaries, hospitals, and other food service providers, as well as direct-to-consumer food outlets such as farmers markets and community-supported agriculture. Because the "other" category comprises such a wide variety of formats, statistical findings drawn from shopping baskets in this category must be interpreted with care.

As reported in table 1, the store formats differ widely from one another in a number of respects. The differences in estimated total store counts among formats are worth noting (fig. 1), because prevalence has implications for consumers' food access. For example, according to Nielsen TDLinx, as of 2013, there were nearly 145,000 U.S. drug and convenience stores (74 percent of all food retail establishments) but approximately 1,200 club stores (1 percent of all food retail establishments). Such disparities help explain why consumers in highly urban or sparse, rural environments frequent smaller format stores, and the fact that many people obtain large shares of their food from the smaller formats motivates an investigation into the nature of grocery purchases made at these establishments.

Figure 1
Shares (percent) of total brick-and-mortar food retail locations, by store format, 2013



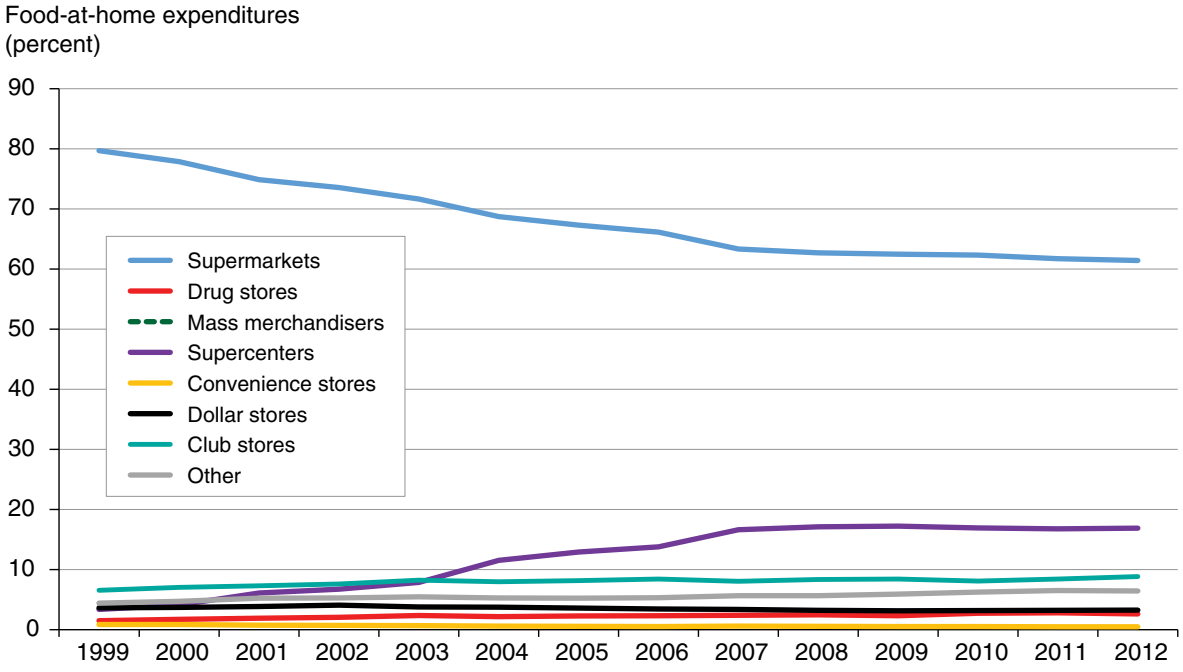
Notes: The total number of brick-and-mortar locations owned by food-selling U.S. retailers is 196,755. The shares given are shares of this total.
Source: USDA, Economic Research Service calculations using Nielsen TDLinx.

Consumers Increasingly Shop at Nontraditionals

A wealth of evidence drawn from several sources suggests that, within the last 10 to 15 years, U.S. consumers have shifted their food expenditures away from conventional supermarkets and toward nontraditional formats. Using retail sales data from the U.S. Census, ERS found that supermarket share of total grocery expenditures among U.S. households fell from 73 percent in 1999 to 64 percent in 2010. Major (2013), reporting for *Progressive Grocer,* reported that the supermarket share of total U.S. food sales fell from 72 percent in 1997 to 59 percent in 2012. The Food Institute (2010) found that the share of U.S. households that even occasionally shop at supermarkets for food fell 2 percent between 2001 and 2009. All three of these sources showed corresponding increases (highest from the Food Institute) for supercenters. The share of households that buy at least a portion of their groceries at supercenters increased 19 percent from 2001 to 2009.

Up to now, of the changes in consumer-food-dollar shares among store formats, the substantial rise in supercenters has garnered the most attention. We calculate the shares of total FAH expenditures, by store format, for the years 1999-2012 using Nielsen Homescan data and the IRI panel (fig. 2).[2] Notably, during this time, the supermarket share of food sales fell from 80 percent to approximately 62 percent. Meanwhile, the share for supercenters increased from 3 percent to 18 percent. Supercenters, such as Wal-Mart, apparently captured most of the share lost by supermarkets.

Figure 2
Shares of food-at-home expenditures, by store format, 1999-2012

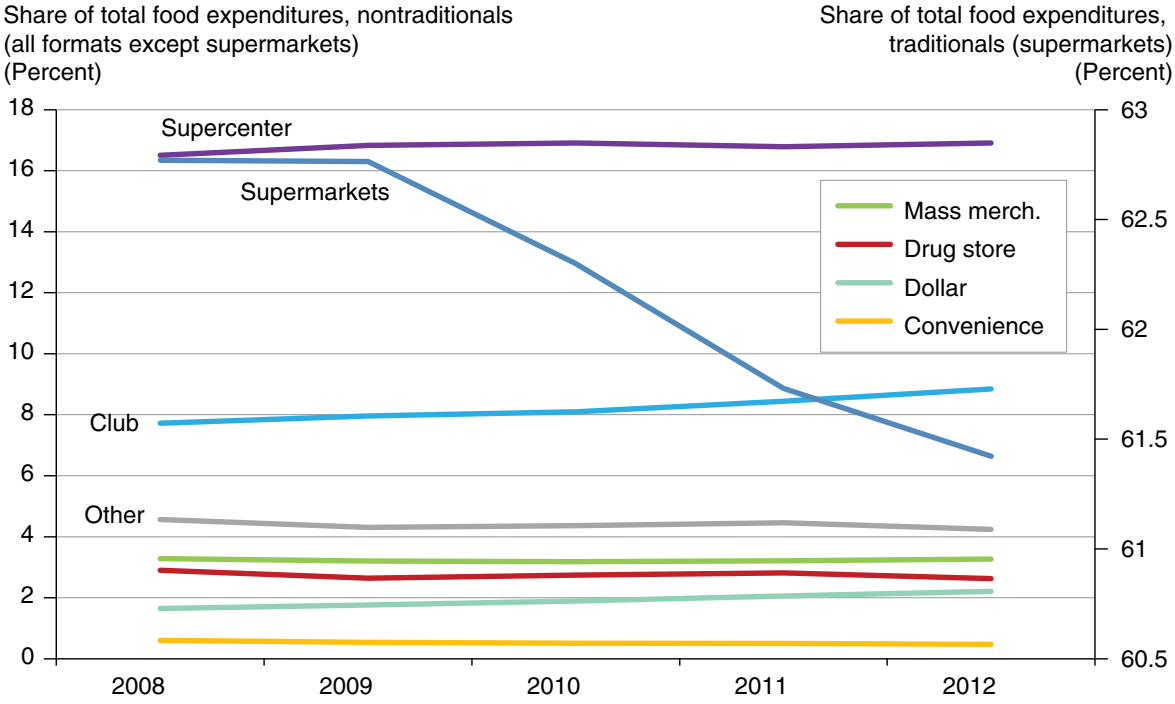


Notes: The Nielsen Homescan data included dollar stores in the "other" category. Therefore, to create a continuous time series of data for representation, the shares of dollar stores and other stores in Information Resources Inc.'s (IRI) Household Panel data were combined for the years 2010-12.
Source: USDA, Economic Research Service calculations using Nielsen Homescan, 1999-2009, and IRI's Household Panel data, 2010-12.

[2] The Nielsen Homescan Survey and the IRI panel contain the same sample of respondents. There are small differences in the content reported across the two datasets. Comparing the years for which we have annual data from both Nielsen and IRI, 2008-10, reveals nearly identical format shares across the two datasets.

A closer look at the nontraditionals (fig. 3) reveals other formats with food-sales volumes that have grown in recent years. The decline in the share of supermarket sales slowed considerably during the years 2008 through 2012, as did the growth in the supercenter format. During this time, the club store sales share grew from 7 percent to 9 percent, and the dollar store share remained small but increased nearly a percentage point. The growth in the dollar store share likely represents the efforts made by many chains of this format to increase their food offerings during the recession and subsequent economic recovery. The rest of the formats showed almost no change from 2008 to 2012.

Figure 3
Share of food-at-home expenditures, by store format, 2008-12



Note: Mass merch = mass merchandiser.
Source: USDA, Economic Research Service calculations using Information Resources, Inc., Household Panel data, 2008-12.

Data and Methods

We analyzed household food expenditures using the 2008-12 IRI panel. The IRI panel dataset consists of the self-scanned food purchases for a nationwide sample of households. Participants are asked to scan and record the prices and quantities of all Univeral Product Code (UPC)-coded food purchases intended for preparation and consumption at home, across all retail outlets. The IRI panel data also include detailed information on household-level demographics. A subset of households is also selected to record their random-weight purchases—those items that do not have UPC codes and depend on weight for their pricing.[3] The whole panel consists of over 116,000 households.[4] However, the static panel includes over 62,000 households. Within this panel, there is also a random-weight (RW) panel, which includes around 28,000 households. The whole panel of data was used for our analysis.[5, 6]

To measure the healthfulness, or dietary quality, of food purchases, we applied two of the measures conceived by Volpe and Okrent (2012). To begin, we constructed monthly shopping baskets by IRI panel household. For each monthly basket, we then calculated *BasketScore1* and *BasketScore2*.

(1) $BasketScore1_{icq} = \left(\sum_c (expshare_{icq} - RECexpshare_{ic})^2\right)^{-1}$

:

(2) $BasketScore2_{icq} = \left(\sum_c (expshare_{icq} - RECexpshare_{ic})^2 | expshare_{icq} > 0\right)^{-1}$,

where

(3) $share_{igq} = \frac{exp_{igq}}{\sum_{g=1}^{24} exp_{igq}}$,

expshare is the expenditure share each household spent on each food group and *RECexpshare* is the expenditure share for each household based on the age and gender of household members. *BasketScore1* assigns penalties for any deviation from the recommended amounts, and *BasketScore2* excludes food categories for which no purchases are recorded in a given month, assuming here that there is a mistake or items were purchased or consumed elsewhere. The higher the BasketScore, the more closely the household aligned with healthy-diet expenditure shares.[7, 8] For example, if

[3] Random-weight purchases are self-recorded by the households. The household records the total price and the weight or count for each item. Since only a subset of the IRI households report their random-weight purchases, these purchases are underrepresented in the data. However, a comparison of the entire, static, and random-weight panels shows that there is little difference between the samples and, more specifically, our main variables of interest (BasketScore1 and BasketScore2).

[4] IRI uses quota sampling, which is a nonrandom method of sample selection that over-samples low-income households. Still, the National Consumer Panel is likely to underrepresent lower income households.

[5] Low-income households are underrepresented in the IRI sample.

[6] As noted, there are three samples within the IRI data, the entire panel, random-weight panel, and static panel. To determine which sample was best for our analysis, we compared the summary statistics for each panel. The results show that there are few differences between the datasets. Perhaps, most importantly, our main variables of interest, BasketScore1and BasketScore2, varied by less than 0.1 across the three samples. Although the RW panel provides data on all random weight purchases, such as fresh fruits and vegetables, and the static panel provides consistent respondent participation, they further underrepresent low-income households. Therefore, since there were only small differences in our variables of interest, we decided to use the entire panel because it allows for a larger sample and more diverse population.

[7] BasketScores cannot be lower than zero, but there is no upper limit on this measure.

[8] Healthy-diet expenditure shares refers to the percentage of a household's expenditures that were spent on foods generally associated with a healthy diet, such as dark green vegetables, whole fruits, and low-fat dairy. These groupings were made based on the majority of items included within each group.

Household 1 has a score of 5 and Household 2 has a score of 8, then Household 2's retail food purchases are more closely in line with healthy-diet expenditure shares than those of Household 1. The complete details of these metrics are available from Volpe and Okrent (2012), but they strive to measure adherence to healthy-diet expenditure shares, assuming parity between foods purchased and foods consumed. These measurements are informed by the food categories and recommendations outlined in the Center for Nutrition Policy and Promotion's (CNPP) *Low-cost, Moderate-cost, and Liberal Food Plans* (Carlson et al., 2007), which are intended to provide guidance to allocate food dollars to promote meeting USDA's Dietary Guidelines for Americans, 2010. Within this report, CNPP provides a series of expenditure shares by food category. We take these expenditure shares and apply them to our categories informed by the plan to create our healthfulness metrics, which compare households' observed expenditure shares with the recommendations for each food category.[9]

Giving evidence of the robustness of these healthfulness measures, the summary statistics for the basket scores are qualitatively similar to those calculated by Volpe and Okrent (2012) (table 2).[10] Differences in the mean basket scores can be partially attributed to the differing time periods, but also to differences in the data. Notably, we use a different dataset because we measure healthfulness using monthly rather than quarterly baskets and we were required to align UPCs to CNPP's *Low-Cost, Moderate-Cost, and Liberal Food Plans* categories following a different strategy.[11,12] The food categories consist of foods that we grouped as generally recommended for either "increased" or "reduced" consumption based on the broad food category. Examples of the former category include

Table 2
Summary statistics for healthfulness measures, comparing IRI data to Nielsen data

Measure	Dataset	Mean	St. dev.	Minimum	Maximum
BasketScore1	IRI panel, 2008-12	5.80	2.13	0.90	11.87
BasketScore2	IRI panel, 2008-12	8.00	3.20	0.99	16.97
USDAScore1	Nielsen Homescan, 1998-2006	7.77	2.56	3.06	36.56
USDAScore2	Nielsen Homecan, 1998-2006	9.31	22.26	6.69	73.00

Notes: St. dev. = Standard deviation
Source: USDA, Economic Research Service calculations using Information Resources, Inc.'s (IRI) Household Panel data and Volpe and Okrent (2012), "Assessing the Healthfulness of Consumers' Grocery Purchases," EIB-102, U.S. Department of Agriculture, Economic Research Service.

[9] Our study uses 24 broad categories, condensed from the 32 specific food categories listed in the 2007 *Low-cost, Moderate-cost, and Liberal Food Plans* (2007).

[10] Volpe and Okrent (2012) refer to BasketScores as USDAScores. While they have a different name, they were calculated using the same method.

[11] The IRI panel data includes many thousands of individual products. To facilitate the creation of healthfulness measures, Volpe and Okrent (2012) calculated *BasketScore1* and *BasketScore2* by aligning the 52 food groups of the Quarterly Food-at-Home Price Database (USDA, QFAHPD, 2011) with an adaptation of the CNPP categories. The UPCs of the IRI panel data have not been organized according to the QFAHPD, and therefore we rely on the 508 key categories, as defined by IRI. The complete details of the matching of the IRI key categories with the CNPP categories are available in appendix A.

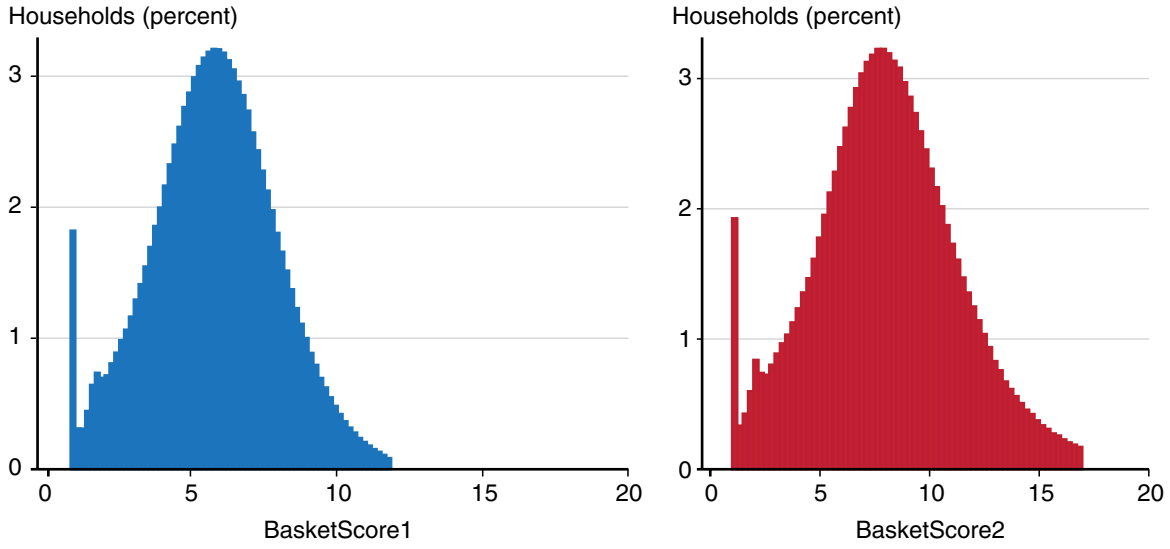
[12] It is important to note that we categorize these foods based on broad categories as we do not have the nutrient information available within our dataset to use the 32 specific categories within the *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007).

whole grains and fresh fruits and vegetables, while the latter includes foods such as sugars and sweets and full-fat dairy. However, as we do not account for actual nutrient data, we distinguish foods as recommended for increased or reduced consumption based on the 24 broad food categories.[13]

We use histograms (fig. 4) to better understand the distribution of the basket scores among households and therefore the adherence to the recommendations adapted from the *Low-cost, Moderate-cost, and Liberal Food Plans* in the sample. The histograms readily indicate that the two basket scores offer qualitatively similar insights into the healthfulness of consumers' food choices. A wider curve for *BasketScore1* indicates greater variability among individual households' scores than *BasketScore2* does. In addition, the ends of the histograms are not symmetric. The left end, comprising households with the lowest, least healthy basket scores (skewing away from adherence to food expenditure recommendations), is considerably taller and narrower than the right end, comprising households with the highest, most healthy scores.

The IRI panel data categorize retailers according to channel, or store format. Therefore, all food purchases in the data can be tracked to the formats at which they were made, allowing us to study the potential relationships among store format and food choices. Retailers in the IRI panel fall into one of eight store formats: grocery (or supermarket), drug stores, mass merchandisers, supercenters, convenience stores, dollar stores, club stores, and other. Our research seeks not only to shed light on how consumers' food-shopping decisions may differ between traditional supermarkets and nontraditional retailers, but also to investigate the possibility that choices differ across the various nontraditional outlets. IRI households may shop at one or multiple store formats in a given month.

Figure 4
Shares of households by basket score rankings (from lowest, least healthy to highest, most healthy)



Notes: BasketScore1 and BasketScore2 measure how well Americans' food purchases adhere to the *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007) from USDA's Center for Nutrition Policy and Promotion. The lower scores signify less healthy food purchases and the higher scores, more healthy.

Source: USDA, Economic Research Service calculations using Information Resources Inc.'s Household Panel data, 2008-12.

[13] Table A.2 outlines which categories are considered recommended for increased or reduced consumption.

Store Formats and Spending Patterns

Because substantial evidence suggests that large supermarkets facilitate the purchase of healthful foods, such as fresh fruits and vegetables, we uncover useful patterns by examining which food purchases are made at which store formats as well as by considering correlations among these variables: store format, consumer income level, and the healthfulness of purchases. For each household-level monthly shopping basket in the IRI panel, we calculate the share of total expenditures across the eight store formats, the healthfulness scores (*BasketScore1* and *BasketScore2*), and the shares of expenditures accounted for by each of the 24 food categories (table A.1). We then compare these variables using correlation coefficients (table 3).

In general, the store format variables and the variables that describe the content of shopping baskets share statistically significant correlations. The proper interpretation of these coefficients is as follows, using the relationship between supermarket share and *BasketScore1* as an example: monthly shopping baskets with higher shares of spending at supermarkets are likely to have higher values for *BasketScore1*, and monthly shopping baskets with lower shares of spending at supermarkets are likely to have lower values for *BasketScore1*. The higher basket scores positively correlate with supermarket, supercenter, and club store expenditure shares and negatively correlate with the remaining store formats. In terms of the overall basket scores, the strongest correlations are negative and pertain to drug stores and dollar stores. That is, increased monthly expenditure shares at these formats are most strongly associated with decreased alignment with healthy-diet expenditure shares. The correlations involving supercenter expenditure shares are the weakest.

These findings are broadly in line with the results of the studies that served to motivate this report. Convenience stores, drug stores, dollar stores, and mass merchandisers are generally recognized as offering few traditionally healthful foods, such as fresh fruits and vegetables, whole grains, and lean meats or fish. With respect to supercenters, Courtemanche and Carden (2011) found a causal relationship between the number of supercenters entering a market and obesity in major U.S. cities, and Volpe and Okrent (2012) found that increased supercenter market share reduced FAH dietary quality. However, both of these studies relied on older data (1993-2005 in the former study, 1998-2006 in the latter), and Volpe and Okrent (2012) showed that the effect of supercenter market share on food healthfulness decreased considerably over time. The efforts of supercenter chains, particularly Wal-Mart, to improve the healthfulness of their food offerings (Wal-Mart Inc., 2007; Warner, 2006; Cline, 2005) merit further attention and research.

By looking at correlations with the individual food categories, it is possible to understand what specific purchase patterns are driving the correlations among basket scores and store formats. As explained previously, our food categories, which are informed by the *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007), typically consist of foods recommended for either increased or reduced consumption. Beginning with foods in the "increased consumption" category, the shares of expenditures on all vegetable groups positively correlate with supermarket patronage. However, the correlations are mixed for club stores and predominantly negative for all other formats. Whole fruit expenditures positively correlate only with the club store formats. The correlations between fish and seafood expenditures and store formats, while small in all cases, are only positive with supermarkets and club store formats. Likewise, for some foods recommended for reduced consumption, the correlations are reversed. For sugars and sweets as well as soft drinks (including sodas), expenditure shares negatively correlate with supermarkets and club stores and positively correlate with all other formats.

Table 3

Correlations between store formats and basket scores and correlations between store formats and expenditure shares, by food category, 2008-12

	Correlation coefficients							
	Super-markets	Drug stores	Mass merch.	Super-centers	Conv. stores	Dollar stores	Club stores	Other
BasketScore1	0.11068	-0.1311	-0.0852	0.02182	-0.0881	-0.1223	0.04407	-0.0838
BasketScore2	0.10116	-0.1176	-0.0782	0.0091	-0.0789	-0.1063	0.05634	-0.0791
Whole grain products	0.03857	-0.0152	0.00568	-0.0125	-0.023	-0.0405	-0.0164	-0.0081
Non-whole grain	-0.0144	-0.0211	0.03085	-0.0197	0.00321	0.02882	-0.0249	0.06374
Potato products	0.02219	-0.0106	-0.0059	0.00334	0.02057	0.01675	-0.0481	-0.0071
Dark green vegetables	0.02601	-0.0255	-0.0203	-0.0079	-0.0177	-0.0129	0.00956	-0.0084
Orange vegetables	0.00983	-0.0085	-0.006	0.00382	-0.0039	0.00452	-0.0176	-0.0006
Beans, lentils, etc.	0.04322	-0.0366	-0.0279	-0.0076	-0.0202	-0.0097	-0.0148	-0.0083
Other vegetables	0.07228	-0.0469	-0.0427	-0.0336	-0.0327	-0.0269	0.01084	-0.0205
Whole fruits	-0.0042	-0.0091	-0.0094	-0.0106	-0.0208	-0.0107	0.05351	-0.0042
Fruit juice	0.03328	-0.0123	-0.0096	-0.0368	-0.0084	-0.0379	0.03564	-0.0055
Whole milk products	0.06833	-0.0094	-0.0247	-0.0297	0.01167	-0.0198	-0.0421	-0.0164
Low-fat dairy	0.04811	-0.0016	-0.0154	-0.025	0.02652	-0.0497	0.00066	-0.0272
Cheese	0.05782	-0.0689	-0.0443	-0.0054	-0.0341	-0.049	0.03293	-0.0365
Beef, pork, veal, lamb, game	-0.0261	-0.0248	-0.0119	0.0145	-0.0099	-0.0069	0.06177	-0.0055
Chicken, turkey, game birds	-0.0348	-0.0515	-0.0148	0.04481	-0.0221	-0.0331	0.07609	-0.0199
Fish and fish products	0.01335	-0.0218	-0.0272	-0.0276	-0.0201	-0.0166	0.07041	-0.0054
Bacon, sausages, lunch meats	-0.0048	-0.0721	-0.0439	0.08011	-0.026	-0.0252	-0.0045	-0.0296
Nuts, nut butters, seeds	-0.0612	0.07245	0.01287	-0.0195	-0.0135	-0.004	0.10706	0.00517
Eggs, egg mixtures	0.03448	-0.0246	-0.0239	-0.0142	-0.0139	-0.0182	0.0063	-0.008
Fats and condiments	0.07601	-0.0691	-0.0446	-0.0408	-0.0342	-0.0158	0.00687	-0.0029
Coffee and tea	-0.0246	0.01788	0.01402	-0.0188	-0.0036	-0.0012	0.03541	0.02853
Soft drinks, sodas, fruit drinks, ades, rice beverages	-0.0679	0.05058	0.03056	0.04187	0.11056	0.07624	-0.0695	0.01367
Sugars, sweets, candies	-0.1711	0.22702	0.11163	0.02679	0.01246	0.11285	-0.0065	0.04009
Soups	0.02463	-0.0017	-0.0106	-0.0227	-0.0158	0.00247	-0.0023	0.00299
Frozen or refrigerated entrees	0.04942	-0.0602	-0.0196	0.03403	-0.0231	-0.0496	-0.0316	-0.0468

Notes: All correlation coefficients are statistically significant at the 0.01 level. Mass merch. = mass merchandisers. Conv. stores = convenience stores.

Source: USDA, Economic Research Service calculations using Information Resources Inc.'s Household Panel data, 2008-12.

The correlations between the basket scores and the store format expenditure shares are observed mainly for these food groups: fruits, vegetables, fish, sugars and sweets, and soft drinks.[14] For most other food categories, the correlations are weak and do not exhibit clear patterns across store formats. For example, supermarket expenditure shares negatively correlate with both beef and pork as well as chicken, turkey, and other lean meats. However, supermarket expenditure shares positively correlate with whole grains. Expenditure shares in drug stores, mass merchandisers, convenience stores, and dollar stores negatively correlate with frozen or refrigerated entrees, which are a large share of average consumer food spending and generally recommended for reduced consumption.[15] This negative correlation is likely a function of the product assortment at these stores, where the scarcity of temperature-controlled shelf space limits of the availability of entrees and dinners.

Because many of the research and policy implications with respect to store choice, food choices, and dietary quality focus on low-income households, we calculate correlation matrices by income group in the IRI data (table 4). Income groups are based on the number of individuals in each household (average household income per capita). Most of the format-specific correlations decrease as consumer income levels per capita increase, suggesting that store format choices play a larger role in shaping food choices among lower income households. This finding supports other research (e.g., Bustillos et al., 2008) that has argued that access to large supermarkets is central to the availability of healthful food at affordable prices for low-income shoppers. The correlation between

Table 4
Correlations between basket scores and expenditure shares by store format, per income group, 2008-12

	Correlation coefficients							
	Super-markets	Drug stores	Mass merch.	Super-centers	Conv. stores	Dollar stores	Club stores	Other
	Annual income per capita: $0-11,999							
BasketScore1	0.13154	-0.1245	-0.0818	0.03173	-0.1028	-0.155	0.05709	-0.0977
BasketScore2	0.12366	-0.1126	-0.0756	0.02013	-0.0918	-0.135	0.05959	-0.0921
	Annual income per capita: $12,000-24,999							
BasketScore1	0.11068	-0.1291	-0.0872	0.01896	-0.0873	-0.1247	0.04821	-0.0865
BasketScore2	0.0989	-0.1157	-0.0801	0.00823	-0.0784	-0.1067	0.06029	-0.0799
	Annual income per capita: $25,000-49,999							
BasketScore1	0.10192	-0.1362	-0.0858	0.01733	-0.0825	-0.1074	0.04258	-0.0761
BasketScore2	0.09018	-0.1212	-0.0785	0.00778	-0.0732	-0.0925	0.05618	-0.0742

Notes: All correlation coefficients are statistically different from zero at the 0.01 level. Mass merch. = mass merchandisers. Conv. stores = convenience stores.

Source: USDA, Economic Research Service calculations using Information Resources Inc.'s Household Panel data, 2008-12.

[14] According to the 2012 relative importance weights calculated by the Bureau of Labor Statistics for the Consumer Price Index, these foods collectively comprise 32 percent of all food-at-home spending for U.S. households.

[15] Frozen and refrigerated entrees are often rich in nutrients that are recommended for reduced consumption, such as sodium.

BasketScore1 and supermarket share is 0.13 for the lowest income group and 0.10 for the highest. Much of the same literature argues that convenience stores, which can be key food outlets particularly for low-income urban households, do not offer healthful foods in abundance or at competitive prices. The *BasketScore1* correlations for the bottom and top income groups are -0.10 and -0.08, respectively.

The expanding role of dollar stores as food retailers, which has been a popular topic in the press since the Great Recession (December 2007- June 2009), is worth considering in this context as well.[16] The correlations between healthfulness and dollar store expenditures—as they vary across time and demographics—are striking. Among all monthly shopping baskets, dollar stores share the strongest correlations with the Basket Scores, second only to drug stores, and the association is negative. The correlations are stronger for the lowest income group than for the highest. The correlation coefficient between *BasketScore1* and dollar store expenditures is -0.16 for the lowest income bracket and -0.11 for the highest. These data show that consumers, particularly lower income shoppers, are not purchasing foods categorized as healthful from dollar stores.

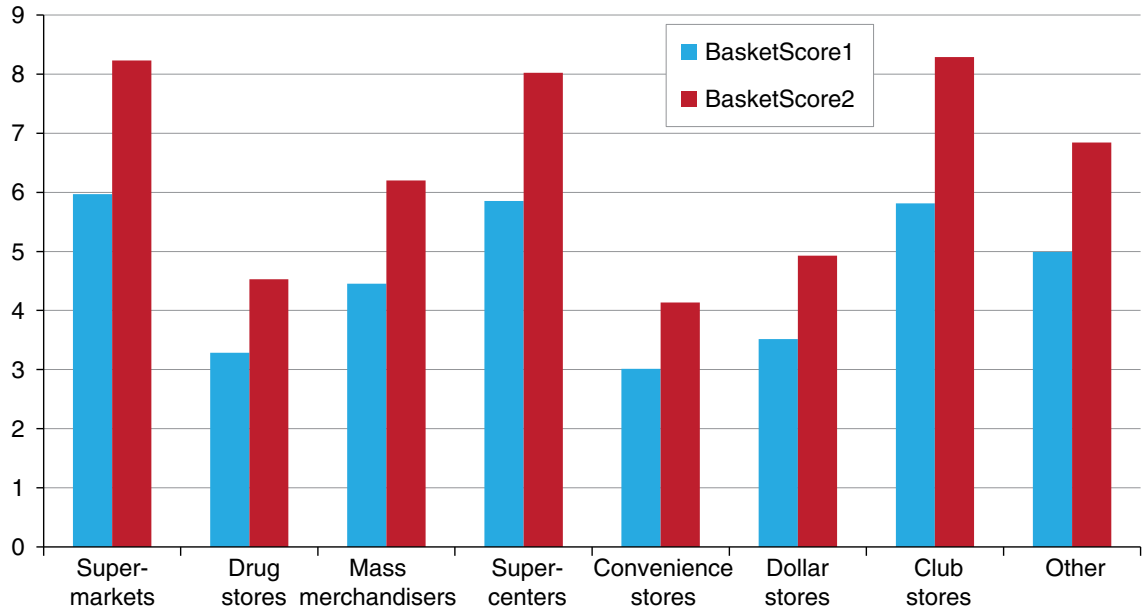
[16] Family Dollar reported that sales in its consumables category, which includes food and tobacco, grew 16.9 percent from August 2012 to August 2013 (Wong, 2013). Both Family Dollar and 99 Cents Only have introduced private-label food products, and the latter chain is scheduled to open a cold warehouse to support its growing range of food products (Zwiebach, 2013).

Monthly Shopping Baskets by Dominant Format

We categorized every monthly food shopping basket in our data set according to the store format accounting for a household's largest share of expenditures.[17] On average, shopping baskets differ across store formats in ways that are significant, both statistically and economically. Correlations between average basket scores and dominant formats are readily apparent in figure 5. The formats align according to three approximate tiers for both *BasketScore1* and *BasketScore2*. Scores are highest for club stores and supermarkets, and these formats are separated by a small gap from supercenters. Other and mass merchandisers follow, featuring noticeably lower scores. The other category has more healthful purchases than mass merchandisers. Finally, baskets dominated by drug stores, convenience stores, and dollar stores feature the least healthful purchases. The average Basket Scores for club store baskets are twice those for convenience store baskets. Similarly, table 5 shows, item by item, that healthful foods (recommended for increased consumption), like dark green vegetables, whole fruits, and low-fat dairy, are purchased more from supermarkets, club stores, and supercenters than from other types of formats and, conversely, there is a lower share of foods recommended for increased consumption purchased from drug stores, convenience stores, and dollar stores.

Figure 5

Average basket scores across monthly shopping baskets, categorized by dominant store format, 2008-12



Notes: "Dominant store format" is the store format that accounts for a household's largest share of expenditures.
Source: USDA, Economic Research Service calculations using Information Resources, Inc.'s Household Panel data, 2008-12.

[17] It was noted that by focusing entirely on correlations or associations between format-level expenditures and food choices, we potentially overstated format effects by ignoring consumers' tendency to shop among multiple stores or formats within a given month or year. In doing so, we also likely picked up on food neighborhood effects, which are beyond the scope of this study. Hence, we relaxed our initial constraint of focusing solely on households that shopped *exclusively* at a particular format and, instead, analyzed *dominant* formats. However, the results based on "100 percent" shopping baskets are closely comparable to those reported in the manuscript, because in most cases households shop predominantly at a single, favored format.

Table 5

Average expenditure shares for food categories across monthly shopping baskets, categorized by the dominant store format, 2008-12

	Super-markets	Drug stores	Mass mer-chandisers	Super-centers	Convenience stores	Dollar stores	Club stores	Other
N (number of each format)	2,789,210	49,318	90,518	712,042	14,729	43,706	247,840	170,826
	---------- Percent ----------							
Food categories								
Whole grain products	2.7	2.0	2.7	2.5	1.3	1.4	2.3	2.5
Non-whole grain	21.7	20.3	24.1	21.3	22.4	25.3	20.8	25.5
Potato products	1.9	1.6	1.8	1.9	2.9	2.3	1.3	1.8
Dark green vegetables	0.5	0.2	0.3	0.4	0.2	0.3	00.5	0.4
Orange vegetables	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.1
Beans, lentils, etc.	1.0	0.3	0.6	0.9	0.4	0.7	0.8	0.9
Other vegetables	2.6	1.0	1.4	2.2	0.8	1.6	2.4	2.1
Whole fruits	1.3	1.0	1.1	1.2	0.5	1.1	1.8	1.2
Fruit juice	2.2	1.6	1.9	1.8	1.7	1.0	2.7	2.1
Whole milk products	5.7	4.8	4.4	5.0	6.5	4.1	4.3	4.8
Low-fat dairy	5.4	4.9	4.5	4.8	7.8	2.7	5.2	4.4
Cheese	5.0	1.9	3.3	4.7	2.1	2.6	5.4	4.0
Beef, pork, veal, lamb, game	0.4	0.2	0.3	0.5	0.2	0.3	1.0	0.5
Chicken, turkey, game birds	1.7	0.4	1.5	2.2	0.6	0.7	3.0	1.5
Fish and fish products	1.8	1.0	1.1	1.5	0.7	1.1	2.7	1.6
Bacon, sausages, lunch meats	5.4	2.1	4.0	6.5	2.9	3.3	5.4	4.8
Nuts, nut butters, seeds	2.2	4.6	2.6	2.1	1.5	2.2	4.0	2.3
Eggs, egg mixtures	1.4	0.8	1.0	1.3	0.8	0.8	1.4	1.2
Fats and condiments	8.3	4.1	6.0	7.3	4.4	6.8	7.9	7.8
Coffee and tea	3.1	3.5	3.4	2.9	2.6	3.0	3.7	3.4
Soft drinks, sodas, fruit drinks, ades, rice beverages	6.6	11.4	9.2	7.8	22.5	13.2	4.8	7.7
Sugars, sweets, candies	7.3	26.0	14.7	8.8	9.9	17.9	8.3	9.8
Soups	2.2	2.1	1.9	2.0	1.2	2.4	2.1	2.2
Frozen or refrigerated entrees	9.6	4.4	8.1	10.0	6.1	5.2	8.2	7.4

Notes: The dominant store format is that with the largest overall expenditure share for a given month. The sample size, N, reports the number of monthly shopping baskets for which each format was dominant in the entire data set.

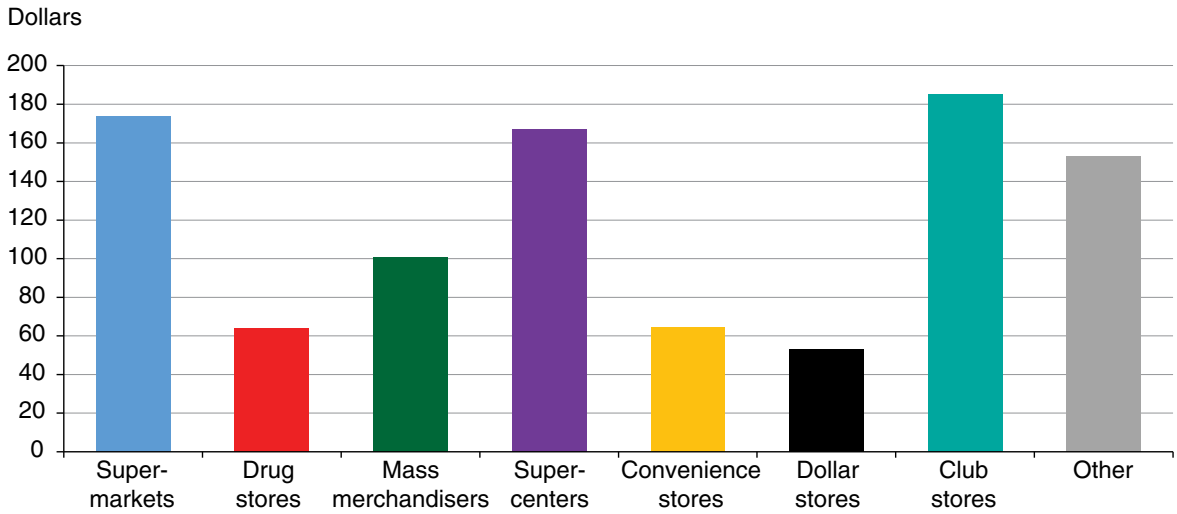
Source: USDA, Economic Research Service calculations using Information Resources, Inc.'s Household Panel data, 2008-12.

Another way in which monthly shopping baskets differ across formats is by dollar value. Club stores have the most floor space, and their shopping baskets are the largest, averaging $185 (fig. 6). Traditional supermarket shopping baskets average slightly less, at $173. Baskets dominated by dollar stores are the smallest, averaging $53 per month. Both convenience stores and drug stores average $64 per month. The Consumer Expenditure Survey of the Bureau of Labor Statistics estimated in 2012 that the average U.S. household spent $326 per month on FAH and that households in the lowest income quintile averaged $201 per month on FAH. Therefore, given that most households do the bulk of their shopping at one dominant store, all households in the data clearly underreport their total grocery purchases to some extent. [18]

When we examine the monthly shopping baskets by dominant store format, a number of demographic patterns emerge that may guide where and how policy (e.g., incentives to new stores to enter a market, such as the New Markets Tax Credit program) can best be implemented. The IRI household data include rich demographic data, and we calculate averages for a variety of household characteristics according to the dominant format of the monthly shopping baskets. The full battery of average demographics, by dominant store format, is available in table A.2.

Store format selection, as indicated by dominant store format, is linked to household income. As income increases, patronage increases at supermarkets and club stores, while it falls or stays essentially flat at all other formats (fig. 7). This result goes hand in hand with the Volpe and Okrent's (2012) finding that income and FAH healthfulness are positively associated.[19] The share of total

Figure 6
Average monthly food-at-home expenditures, by predominant store format, 2008-12



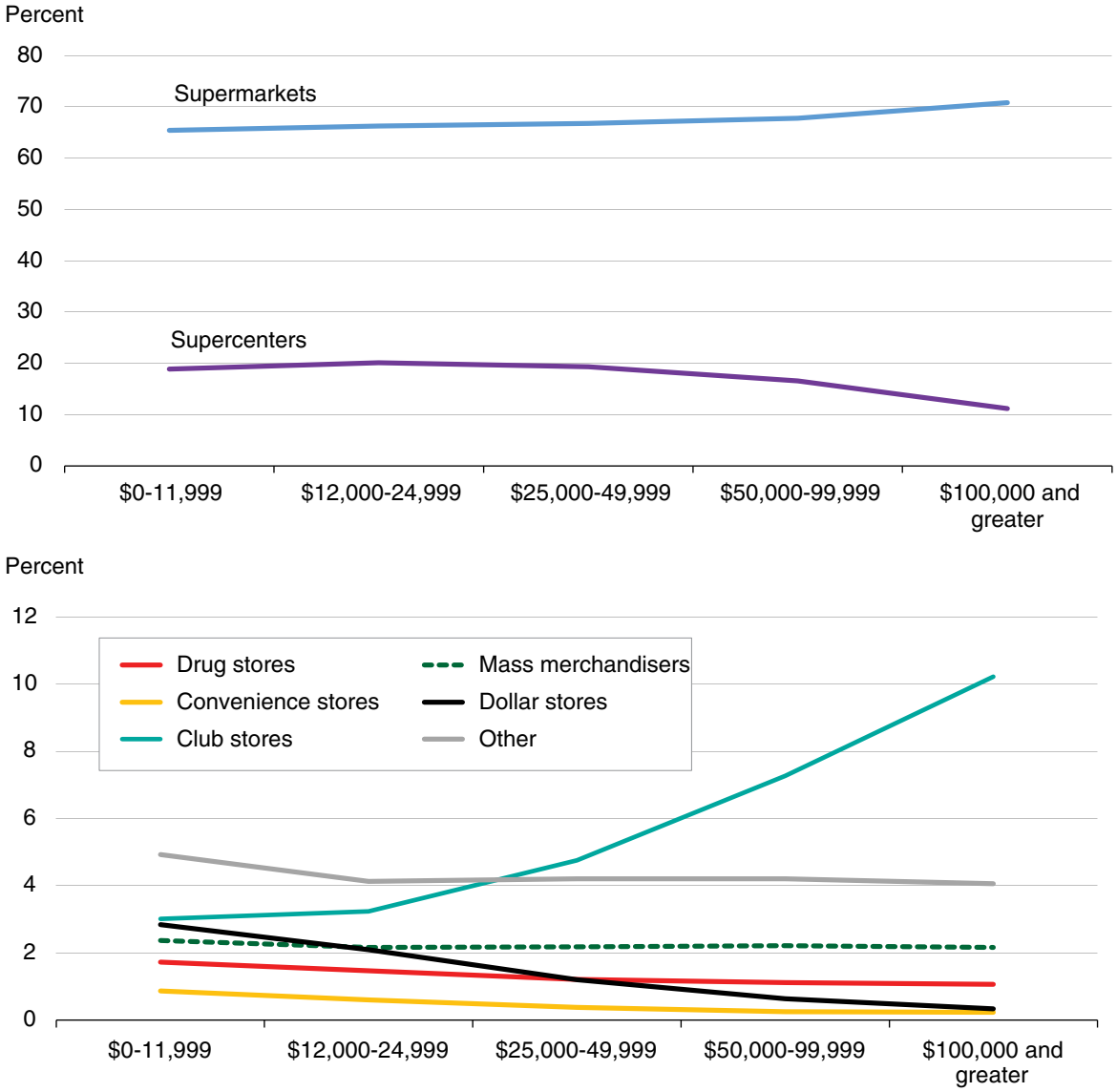
Source: USDA, Economic Research Service calculations using Information Resources, Inc.'s Household Panel data, 2008-12.

[18] For example, consider a household that purchased food at home from four retail channels in one month—supermarkets, convenience stores, mass merchandisers, and supercenters. If that household spent more at supercenters than at any of the other three categories, then that household was labeled as having a dominant share in supercenters for that month. Therefore, households may shop at a range of store formats, but have only one dominant format for a given month.

[19] The Volpe and Okrent (2012) study used the Nielsen Homescan data. The IRI data used for this study also establishes a positive association between income and the BasketScores. The average *BasketScore1* and *BasketScore2* for the lowest income group in the IRI data are 5.59 and 7.75, respectively. For the highest income group, they are 6.77 and 8.76, respectively. Therefore, overall FAH purchases are more healthful, on average, for higher income households.

Figure 7

Shares (percent) of monthly shopping baskets, by dominant store formats and household income levels, 2008-12



Source: USDA, Economic Research Service calculations using Information Resources, Inc.'s Household Panel data, 2008-12.

shopping baskets dominated by supermarkets ranges from 65 percent among the lowest income group to 71 percent among the highest income group, while the supercenter share of baskets ranges from 19 percent to 11 percent, respectively. Among the smaller formats, only the club store and dollar store formats show striking differences among income groups. Club store patronage nearly quadruples from the lowest income group to the highest. Club stores are the dominant format for approximately 3 percent of shopping baskets of the lowest income group and for 10 percent of shopping baskets of the highest income group. The number of formats dominated by dollar stores is low throughout the data set, but the share drops from nearly 3 percent among the lowest income households to effectively zero among the highest income group. The share of baskets dominated by convenience stores also falls with income, from about 1 percent to zero.

Conclusion

With respect to the diverse store formats available to U.S. food shoppers, our results suggest that convenience stores, dollar stores, and "other" category stores are formats in which consumers are more likely to have a lower Basket Score. Convenience stores are a prevalent format for many households, particularly those in dense urban environments, and they are associated with lower expenditures for fruits, vegetables, whole grains, and lean proteins. This correlation is valid for IRI households even though the sample does not fully represent lower income households. Dollar stores are making inroads in the grocery industry across the country, and although their share is still small, they are gaining rapidly. The format is likely to evolve with time, but at present, seems to adversely affect diet quality. More work is needed to properly disentangle the various stores included in the other category and identify what may be driving the associations connected with it.

Although proximity to a certain type of format may not drive the dietary quality of the foods a household purchases, the store format a household selects for the majority of its food purchases does significantly influence dietary quality. We provide broad evidence that store format selection is associated with particular food choices among Americans. As the U.S. food retail industry continues to diversify, these impacts can grow in economic importance. Accordingly, our research opens the door to further research.

A logical and meaningful extension of our work would be to use UPC-level purchase records along with data on store characteristics to identify what drives consumers to purchase significantly different food baskets across formats. We raise several possibilities in this regard, including prices and product assortment, but these effects can be isolated and measured in a rigorous statistical framework. Given that store format seems to be associated with the dietary quality of food purchases, significant relationships may exist between store formats and health outcomes.

It should be noted that shopping at a specific store format does not neccesarily *cause* consumers to purchase less healthy food. Although it is possible that shopping at a specific store format *may* cause consumers to increase purchases of less healthy foods, it is just as likely that households choose where to shop based on their own preferences for types of food, convenience, and quality. Retail food stores may choose which items to stock based on the tastes and preferences of the consumers shopping at their establishments. Using store-level location data, including data on store entries and exits, researchers might be able to identify differences in food choices resulting from changes in the retail environment. This would help determine the extent of a causal relationship between store format choice and healthfulness of food purchases.

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Appendix A

Appendix table A.1
Information Resources, Inc., Household Panel data, key categories aligned with categories informed by USDA's *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007)

	Food category	IRI key category
1	All whole grain products	Kernel popcorn; rice cakes/popcorn cake; wheat germ
2	All non-whole grain breads, cereals, rice, pasta, pies, pastries, snacks, and flours	Hominy grits; brownie mix; chow mein noodles; coffee cake/gingerbread/pastry mix; Dry macaroni and cheese mix; FZ microwave popcorn; ice-cream cones; matzoh crackers; matzoh meal; corn snack other than tortilla chips; Salted snack other than nuts; pretzels; RFG cakes; RFG cheesecake; RFG cookie/brownie dough; RFG eggroll/wonton wrapper; RFG muffins; RFG pastry/danish/coffee cake; RFG pies; RFG snack cake/doughnut (less than 5 oz.); saltine crackers; SS breadsticks; SS cakes; SS canned bread; SS crackers with fillings; SS doughnuts; SS microwave popcorn; SS muffins; SS pastry/danish/coffee cake; SS pies; SS snack/cupcake/brownie (less than 5 oz.); SS stuffing mix; SS toaster pastry/tart; toasted corn nut snacks; tortilla/tostada chips; cookies; dry dinner mix with meat; dry dinner mix without meat; Dry noodles; Ready-to-eat popcorn and caramel corn; SS prepared pasta dishes
3	All potato products	Potato cake/dumpling mix; FZ plain potato/French fry/hash browns; potato chips; SS instant potatoes; uniform weight fresh potato
4	Dark green vegetables	FZ broccoli; FZ spinach; SS canned/bottled green beans; SS canned/bottled spinach; uniform weight fresh broccoli; uniform weight fresh spinach
5	Orange vegetables	FZ carrots; SS canned/bottled potatoes/sweet potatoes; SS canned/bottled carrots; uniform weight fresh carrots; uniform weight fresh yams
6	Canned and dried beans, lentils, and peas	Dried beans/grains; FZ peas; RFG baked beans; SS all other beans; SS baked beans/pork and beans; SS canned/bottled green peas; SS refried beans; FZ beans; uniform weight tofu/soybean
7	Other vegetables	FZ corn; FZ corn on the cob; FZ mixed vegetables; FZ onions; FZ other plain vegetables; RFG vegetable juice/cocktail; SS bamboo shoots/water chestnuts; SS canned all other vegetables; SS canned vegetable juice/cocktail; SS canned/bottled corn; SS canned/bottled mushrooms; SS canned/bottled tomatoes; SS canned/bottled vegetables; SS other vegetable juices; uniform weight fresh other vegetables; uniform weight fresh cabbage; uniform weight fresh cauliflower; uniform weight fresh celery; uniform weight fresh cucumber; uniform weight fresh lettuce; uniform weight fresh mixed vegetables; uniform weight fresh mushrooms; uniform weight fresh onions; uniform weight fresh peas; uniform weight fresh radish; uniform weight fresh sprouts; uniform weight fresh tomato; dried vegetables other than beans
8	Whole fruits	Dates; dried prunes; fruits - all types; FZ fruit; other dried fruits/not processed snacks; raisins; SS all other fruit; SS apple sauce/fruit sauce; SS canned/bottled apples; SS canned/bottled apricots; SS canned/bottled berries; SS canned/bottled cherries; SS canned/bottled citrus fruit; SS canned/bottled grapes; SS canned/bottled mixed fruit; SS canned/bottled peaches; SS canned/bottled pears; SS canned/bottled pineapples; SS canned/bottled plums; SS maraschino cherries; uniform weight fresh other fruit; uniform weight fresh apples; uniform weight fresh grapefruit; uniform weight fresh oranges

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Appendix table A.1

Information Resources, Inc., Household Panel Data key categories aligned with categories informed by USDA's *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007) —continued

	Food category	IRI key category
9	Fruit juices	FZ apple juice concentrate; FZ blended fruit juice concentrate; FZ grape juice concentrate; FZ grapefruit juice concentrate; FZ orange juice concentrate; FZ vegetable/fruit juice concentrate; RFG all other fruit juice; RFG apple juice; RFG blended fruit juice; RFG bottled juice and drink smoothies; RFG cranberry juice/ cranberry juice blend; RFG fruit juice liquid concentrate; RFG fruit nectar; RFG grape juice; RFG grapefruit juice; RFG lemon/lime juice; RFG orange juice; RFG pineapple juice; SS apple juice NAC; SS apricot juice NAC; SS bottled juice and drink smoothies; SS canned fruit juice (all flavors); SS cherry juice NAC; SS cranberry juice/cranberry juice blend NAC; SS fruit juice blend NAC; SS fruit juice liquid concentrate; SS fruit nectar NAC; SS grape juice NAC; SS grapefruit cocktail NAC; SS grapefruit juice NAC; SS lemon/lime juice NAC; SS orange juice NAC; SS other fruit juice NAC; SS pineapple juice NAC; SS prune/fig juice NAC; SS sparkling juice NAC
10	Whole milk products	Cream cheese/cream cheese spreads; dry whip topping mix; FZ coffee creamer; FZ ice cream/ice milk desserts; FZ whip toppings; FZ yogurt/tofu-cartons; ice cream-carton; RFG coffee creamer; RFG dairy cream/half & half/ soy topping; RFG flavored milk/egg nog/buttermilk; RFG kefir/milk substitutes/ soy milk; RFG milkshake/non-dairy milk; RFG whole milk; Sour cream; SS breakfast drink mixes; SS coffee creamer; SS frost/whipped/yogurt drink mix; SS RTD milk/milk substitutes; SS yogurt/yogurt drinks
11	Lower fat and skim milk and yogurt	RFG skim/low-fat milk
12	All cheese	All other processed cheese; American cheese (all forms); cheese - all types (clerk-served); cheese - all types (self-served); cheese snacks; cheese spreads/ balls; imitation cheese (all forms); natural cheese (not shredded); natural shredded cheese; processed shredded cheese; RFG grated cheese; SS aerosol/squeezable cheese spread; SS dairy sauce/cheese; SS grated cheese; ricotta cheese; cottage cheese
13	Beef, pork, veal, lamb, and game	Beef/veal (all cuts); FZ meat (no poultry); Pork (all cuts); RFG canned/bottled ham; RFG pork hock/feet; SS canned/bottled ham
14	Chicken, turkey, and game birds	Chicken (all cuts); FZ RFG poultry/poultry substitutes; turkey (all cuts)
15	Fish and fish products	Fish/shellfish (all cuts); FZ fish/seafood; RFG fish/herring/seafood; SS all other fish/seafood; SS clam juice; SS salmon; SS tuna
16	Bacon, sausages, and luncheon meats	Dried meat snacks; FZ frankfurters/wieners; FZ sausage; other meat (all cuts); RFG bacon; RFG breakfast sausage/ham; RFG dinner sausage (Polish/Italian); RFG frankfurters/wieners; RFG non-sliced lunch meats; RFG salad topping/ bacon bits; RFG sliced/shaved lunch meats; RFG uncooked meats; salad toppings/bacon bits; sausage (all cuts); SS lunch meats; deli cold cuts, all types; RFG cold cuts, all types
17	Nuts, nut butters, and seeds	Chunky peanut butter; creamy peanut butter; nutritional snack/trail mix; nuts for baking and cooking; peanut butter combo-peanut butter and jelly; RFG peanut butter (all); snack nuts; specialty nut butter; sunflower/pumpkin seeds
18	Eggs and egg mixtures	FZ egg substitutes, RFG egg substitutes; RFG fresh eggs; SS egg substitutes

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Appendix table A.1

Information Resources, Inc., Household Panel Data key categories aligned with categories informed by USDA's *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007) —continued

	Food category	IRI key category
19	Fats and condiments	All other dry seasoning mixes; Asian cooking oils; baking powder/soda; catsup/ketchup; chutney; cooking and salad oils; cooking sherry/wine; cooking spray; cooking starches/rennet; corn/caro/crystal/white syrup; dry gravy mixes; dry meat/seafood seasoning mixes; dry sauce mix; FZ meat/seafood seasoning mixes; FZ sauce/gravy/marinade; ketchup/mustard/other combo; margarine/margarine and butter blend/substitutes; olive oil; pepper; popcorn oil; prepared mustard; RFG butter (all flavors); RFG flavored spreads; RFG horseradish/horseradish sauce; RFG lard; RFG meat/seafood seasoning mixes; RFG mustard; RFG non-dairy toppings; RFG pepper/pimento/olives; RFG pickles; RFG relishes/appetizer relishes; RFG salad dressing (pourable/spread); RFG sauce/gravy/marinade; RFG sauerkraut; salt/salt seasoning/salt substitutes; spice/seasoning (no salt/pepper); SS all other Mexican sauces/marinades; SS Asian sauces/marinades; SS canned/bottled sauerkraut; SS chili/hot dog sauce; SS cranberry sauce; SS dry dip mixes; SS garlic spread; SS hollandaise, béarnaise, or dill sauce; SS horseradish sauce; SS meat sauce, marinade, or glaze; SS meat spread; SS olives; SS peppers and pimentos; SS picante sauce; SS pickles; SS pourable salad dressing; SS prepared barbecue sauce; SS prepared dip; SS hot or Cajun sauce; SS Italian sauce; SS liquid gravy; SS prepared pineapple sauce; SS pizza sauce; SS prepared seafood sauce; SS prepared sloppy sauce; SS prepared taco sauce; SS prepared tartar sauce; SS relish and appetizer relish; SS salad dressing mix; SS salsa; SS sandwich spread and mayonnaise; SS steak and Worcestershire sauce; SS tomato paste; sauce; and puree; SS vegetable or animal shortening and lard; SS coleslaw and fruit salad dressing; vinegar
20	Coffee and tea	Coffee (ground and whole bean); coffee substitutes; coffee and tea additives and flavorings; ground coffee (including flavored); ground decaffeinated coffee (including flavored); instant coffee; instant decaffeinated coffee; instant tea or ice tea mixes; loose tea and tea bags; RFG coffee concentrate; RFG prepared teas; RFG ready-to-drink coffee; SS canned and prepared tea; SS coffee cappuccino drinks; whole coffee beans
21	Soft drinks, sodas, fruit drinks, and ades	FZ cocktail mixes; FZ drinks and cocktail drink concentrates; low calorie soft drinks; soft drinks; regular soft drinks; RFG cider; RFG cocktail mixes; RFG cranberry cocktails and drinks; RFG drink concentrate or syrup; RFG fruit drinks, all flavors; RFG grapefruit cocktails and drinks; RFG lemonade; SS aseptic isotonic drinks; SS aseptic juice all flavors; SS aseptic juice drink; SS canned juice drinks; SS cider, not a concentrate; SS cranberry cocktail and juice drink, not a concentrate; SS drink concentrate and syrup; SS fruit drink mix; SS fruit drink, not a concentrate; SS isotonic drink mix; SS isotonic drinks non-aseptic; SS lemonade; SS liquid cocktail mixes; SS non fruit or coffee drinks; SS powder cocktail mixes; FZ lemonade and limeade concentrate; ready-to-drink breakfast meals

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Appendix table A.1

Information Resources, Inc., Household Panel Data key categories aligned with categories informed by USDA's *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007) —continued

	Food category	IRI key category
22	Sugars, sweets, and candies	All other seasonal candy; baking chocolate, chocolate chips, and cocoa; brown, powdered, and flavored sugar; caramel or taffy apples; carob/yogurt coated snacks; chocolate candy bar, less than 3.5 oz.; chocolate candy boxed or bagged, greater than 3.5 oz.; chocolate candy, snack size; chocolate covered cookie or wafer candy bars; chocolate covered salted snacks; chocolate milk flavoring or cocoa mix; chocolate syrup and dessert toppings; christmas candy; diet candy; Easter candy; edible cake decorations; extracts, flavorings, and food coloring; flavored hot drink mix; fruit flavored syrups; fruit roll ups, bars, and processed fruit snacks; fruit and vegetable preservatives and pectin; gelatin dessert mix; gift box chocolates; glazed fruit; Halloween candy; hard sugar candy, packaged or rolled; ice cream mix; licorice boxes or bags, greater than 3.5 oz.; maple syrup; marshmallow crème; marshmallows; milk chocolate flavoring and drink mix; molasses; non-chocolate chewy candy in a big box or bag, greater than 3.5 oz.; non-chocolate chewy candy bar, less than 3.5 oz.; non-chocolate chewy candy, snack size; novelty candy; plain mints; pudding, pie filling, and mousse mixes; regular gum (not sugarless); RFG honey; RFG pudding, mousse, gelatin, and parfaits; ready-to-serve frosting and frosting mix; salted apple chips; specialty nuts and coconut candy; SS honey; SS ice pop novelties; SS jams, jellies, and preserve; SS pie or pastry filling; SS prepared pudding and gelatin; straws and swizzle sticks; sugar substitutes; sugarless gum; taffy and candy apple kits; valentine candy; white granulated sugar
23	Soups	FZ chili; FZ soup; RFG fresh soups; RFG prepared chili; SS dry soups and soup mixes; SS prepared chili; SS soup; SS soup starter, bouillon, and broth
24	Frozen or refrigerated entrees	FZ regular dinners; FZ regular entrees; FZ or RFG meat substitutes, not poultry; FZ appetizer and snack rolls; FZ breaded vegetables; FZ cheesecake; FZ cookie dough; FZ egg rolls, pot stickers, and wonton wrappers; FZ handheld non-breakfast entrees; FZ jams, jellies, and preserves; FZ meat spreads and salads; FZ novelties, single serving; FZ onion rings; FZ other breakfast food; FZ pies; FZ pizza; FZ pot pies; FZ prepared dips; FZ prepared pudding and mousse; FZ prepared vegetables in sauce; FZ pretzels; FZ ready to eat cookies; FZ side dish; FZ stuffing; FZ sweet goods, not cheesecake; RFG appetizers and snack rolls; RFG breakfast entrées; RFG handheld non-breakfast entrées; RFG meat spread and salad; RFG meat, cheese, and cracker desserts; RFG pizza and pizza kits; RFG pot pies; RFG prepared dinners and entrees; RFG prepared dips; RFG side dishes; sherbet, sorbet, and ice cream, carton; SS microwave package dinners and entrées; SS pizza kits and mixes, toppings; SS regular prepared dinners and entrees; dry salad and side dish mix; SS dried breakfast food

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Appendix table A.1

Information Resources, Inc., Household Panel Data key categories aligned with categories informed by USDA's *Low-Cost, Moderate-Cost, and Liberal Food Plans* (2007) —continued

Food category	IRI key category
1 or 2[a]	All other baking mixes; all other crackers; baked goods – bagels; baked goods – breads; baked goods - cakes, all types; baked goods - cookies, all types; baked goods – muffins; baked goods - other baked goods; baked goods - pies, all types; baked goods – rolls; bread mixes; breadcrumbs; breading, batter, and coating mixes; cake, cupcake, and pie mix; cookie and cookie bar mix; cornmeal and baking oat bran; croutons, not for stuffing; dry rice; dry rice mixes; dry spaghetti, macaroni, and pasta; flour; FZ bagels; FZ bread, roll, and pastry dough; FZ fresh baked bread, rolls, and biscuits; FZ hard or soft tortillas; FZ pasta and noodles; FZ pie and pastry shells; FZ pizza crusts and dough; FZ pre-baked muffins; FZ waffles; graham cracker crumbs; graham crackers; hot cereal and oatmeal; muffin mix; nutritional snack bars and granola bars; pancake, French toast, and waffle mix; pie crust mix; pizza crust mix; ready-to-eat cereal; RFG bagels and bialys; RFG biscuit dough; RFG bread; RFG dinner or sandwich rolls and croissants; RFG bread, roll, or bun dough; RFG pastry or dumpling dough; RFG English muffins; RFG hard or soft tortillas; RFG pizza crust and dough; RFG deli pasta and noodles; SS bagels and bialys; SS bread, not canned; SS English muffins; SS fresh rolls, buns, and croissants; SS hard or soft tortillas and taco kits; SS ready to use pie crust
10 or 11	Evaporated condensed milk; powdered milk; RFG yogurt; RFG yogurt drinks
2, 3, or 7	SS prepared salad
2, 6, 15, 19, or 22	SS Asian food items
2, 6, 7, 15,18, 19, 22, or 23	SS Mexican food items
4 or 7	Fresh cut salad and coleslaw; RFG prepared salad, fruit salad, and coleslaw
5 or 7	FZ squash and zucchini; uniform weight fresh peppers
7, 8, or 18	RFG marinated vegetables, fruits, and eggs; SS marinated vegetables, fruits, and eggs

a: Not all Information Resources, Inc., key categories fall entirely within USDA, Center for Nutrition Policy and Promotion categories. In these cases, we sorted by individual universal product codes (UPCs), according to the product descriptions. For example, several key categories contain both wholegrain and non-wholegrain products.

RFG = refrigerated. FZ = frozen. SS = shelf stable. NAC = not from a concentrate.

Source: USDA, Economic Research Service using data from Information Resources, Inc., and USDA, Center for Nutrition Policy and Promotion.

Appendix table A.2

Consumption recommendations based on food category

Food category	Recommendation
Whole grain products	Increased
Non-whole grain	Reduced
Potato products	Increased
Dark green vegetables	Increased
Orange vegetables	Increased
Beans, lentils, etc.	Increased
Other vegetables	Increased
Whole fruits	Increased
Fruit juice	Reduced
Whole milk products	Reduced
Low-fat dairy	Increased
Cheese	Reduced
Beef, pork, veal, lamb, game	Reduced
Chicken, turkey, game birds	Increased
Fish and fish products	Increased
Bacon, sausages, lunch meats	Reduced
Nuts, nut butters, seeds	Increased
Eggs, egg mixtures	Increased
Fats and condiments	Reduced
Coffee and tea	Increased
Soft drinks, sodas, fruit drinks, ades, rice beverages	Reduced
Sugars, sweets, candies	Reduced
Soups	Reduced
Frozen or refrigerated entrees	Reduced

Source: USDA, Economic Research Service using data from Information Resources, Inc.