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An Assessment of Product Turnover in the U.S. Food Industry and Effects on Nutrient Content

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Abstract

ERS researchers use IRI retail store data from 2008 to 2012 to describe the extent of product entry and exit in 17 food and beverage categories. As consumers demand healthier food and beverage products, research is needed to highlight changes in nutrient composition associated with product innovation strategies. The nutrient content implications of product turnover are examined by comparing nutritional quality of products entering the market, products exiting the market, and "established" products (i.e., neither entered nor exited). Differences in nutritional content of entering and exiting products have significant implications over time for changes in the nutritional profiles of product categories with relatively high turnover rates.

Keywords: Nutrient content, product entry, product exit, product creation, product destruction, nutrient content claims, nutritional profiles, food composition, food product nutrition

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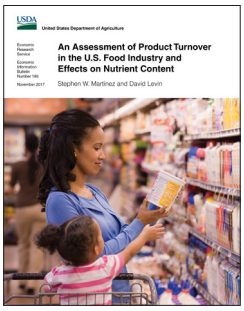


An Assessment of Product Turnover in the U.S. Food Industry and Effects on Nutrient Content

Stephen W. Martinez and David Levin

What Is the Issue?

Americans' diets and the consequences for public health are key questions when considering the fiscal and human cost of conditions such as obesity, hypertension, and diabetes. These concerns have prompted Government policies, including mandatory disclosure of nutrient content, regulation of product claims, and funding of nutrition education programs. These policies may raise consumer awareness and increase consumer demand for healthier products, which may in turn prompt the food industry to reformulate products. ERS tracks food products' nutritional quality and how it coincides with shifts in Government policy and consumer demand.

New food products continually replace unsuccessful ones in the marketplace. Product categories with high turnover, such as snacks and breakfast cereals, may have considerable nutrient changes over time. For example, if products entering the market are more nutritious on average than exiting products, then nutritional quality for a category as a whole may improve. However, the effect of new, nutritionally improved versions of products may also be offset by exiting products with better-than-average nutritional profiles, resulting in little change in nutritional quality. Tracking product entries and exits in high-turnover categories can help to better capture the resulting, potentially rapid nutritional changes that improve national nutrition monitoring efforts.

In this report, we quantify products' entry and exit from the marketplace using data from 2008 to 2012 and break down these changes across food categories. Based on our methodology, 2009 is the first year we are able to compute the number of entering and exiting products. We also examine the implications that product turnover may hold for nutritional content.

What Did the Study Find?

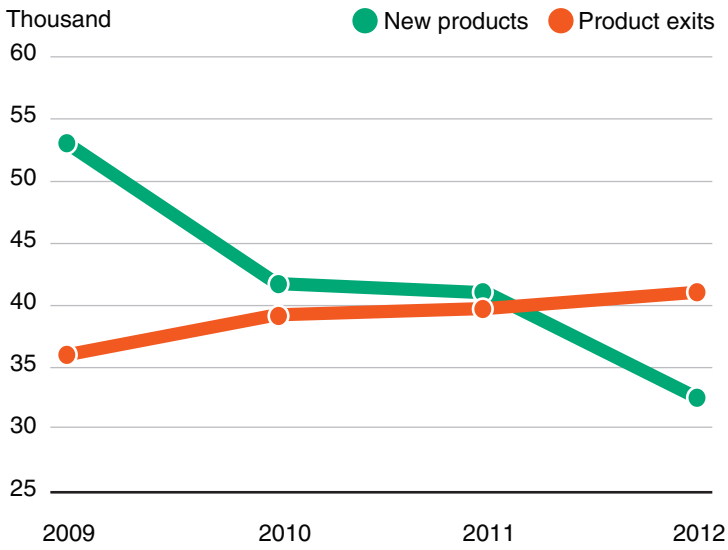
In 17 food and beverage categories, the number of new products introduced to the market declined from 53,061 in 2009 to 32,600 in 2012. Over the same period, the number of products exiting the market increased from 36,056 to 41,069. By 2012, product exits exceeded entries. The variety of products sold in retail stores increased slightly before declining in 2012.

- Categories with the highest shares of new products include candy, snacks, and beverages.
- Product categories with the highest turnover include candy and nutrition/weight-loss foods.

- Our examination of product entries and exits in five categories revealed significant changes in nutritional quality from 2008 to 2012. For example, the yogurt category saw a 20-percentage-point increase in average fiber content per serving. Over the same time period, yogurt products entered the market with 47 percent more fiber per serving on average than exiting products. This finding reflects the growing popularity of probiotic yogurt and the addition of yogurt toppings.
- Across all five categories, breakfast cereal products sold at retail stores showed the most nutritional changes overall, while the snack category showed the fewest changes.

Summary figure

Number of entering and exiting food and beverage products, 2009-12



Note: Walmart first appears in the IRI data in 2009.
Source: IRI InfoScan data.

- Fairly large increases (approximately 15-percentage-point changes from 2008 to 2012) occurred in saturated fat in the breakfast cereal and yogurt categories. The introduction of portable yogurt drinks that satisfy consumers' demand for convenience contributed to the increase in saturated fat.
- In the frozen/refrigerated meals category, trans fats fell by over 15 percentage points, while saturated fats increased. To reduce trans fats consumption, the Government issued Federal dietary guidelines (referred to as the *Dietary Guidelines for Americans*) recommending that consumers limit their trans fats consumption and implemented a regulation requiring that food producers disclose trans fats on nutrition labels. We found no evidence to suggest that manufacturers had added saturated fat to correct unwanted taste changes in products that were reintroduced with smaller amounts of trans fats.
- Gradual reductions in sodium content were found in four out of five product categories. In addition, less than 6 percent of new products in each category carried a "low/no/reduced" sodium package claim.
- Although the *2015-2020 Dietary Guidelines for Americans* identified calcium as an underconsumed nutrient and ranked fortified cereals as a leading source of the nutrient, calcium content in breakfast cereals and snacks has been falling. In addition, few products entered the market with a label claim about the calcium content (e.g., "excellent source," "good source," "calcium enriched").

How Was the Study Conducted?

This report uses data from IRI's InfoScan database from 2008 to 2012 to evaluate changes in the number and sales of food products that entered and exited the market. Given our definition of entering and exiting products, 2009 is the first year these products can be identified. The retail scanner data include prices, quantities, nutrient content, and nutrient content claims. The analyses are restricted to (non-random weight) food and beverage products with universal product codes (UPCs). IRI retail data also contain information on nutritional content that was used to evaluate the nutritional quality of new, exiting, and established products (i.e., neither entered nor exited) using a nutrient-by-nutrient approach over time. Based on availability of data, a subset of five product categories are selected for comparisons of nutritional composition based on the level of product turnover and availability of information on nutrient content.

An Assessment of Product Turnover in the U.S. Food Industry and Effects on Nutrient Content

Introduction

The public has an interest in monitoring changes in the quality of food products, including changes in nutritional quality, which depend on the process through which new products replace old. The process of "creative destruction," in which product features must adapt to ever-evolving consumer preferences and changes in food industry competition, continually replaces obsolete products with new ones.

As new products are introduced, it is critical to gauge how much progress has been made by offering more nutritious food choices and whether the changes to products' nutritional content are in the public interest. A number of researchers have documented reasons for concern. In his book about company strategies in food product formulations, Michael Moss (Moss, 2013) contends that the food industry has become dependent on salt, sugar, and fat in food processing. Efforts to reformulate products to reduce these nutrients result in products with inferior taste and texture. Faced with intense competition for shelf space, companies revert to adding more salt, sugar, and fat when the competing, healthier products exit the market. Moss makes a case that companies manipulate the use of these nutrients to create a craving for their new products.

Using historical data for the cereal industry, Wang et al. (2015) find that the nutritional quality of products declined from 1988 to 2001, but has since improved. They also find that consumers have favored less healthy cereals, despite the availability of healthier alternatives. Based on these findings, they conclude that policies combating obesity should be directed toward influencing consumer preferences (e.g., through health educational programs) rather than enacting supply-side regulations (e.g., mandating reductions in unhealthy nutrients).

Other researchers have focused on nutritional changes in products marketed to children. Harris et al. (2012) find that companies have made incremental nutritional improvements in most cereals marketed to children, but the cereal products continue to be significantly less nutritious compared to adult-targeted cereal brands. Similarly, Powell et al. (2011) document changes in TV advertisements seen by children for products that are high in saturated fat, sugar, or sodium. Despite reduced advertising exposure, a large percentage of food and beverage advertisements seen by children continue to market products with high levels of these nutrients.

Reformulation of food products is often promoted as an effective strategy to reduce Americans' intake of unhealthy nutrients. For example, initiatives to reduce sodium in packaged foods have been launched in the United States. The National Academy of Medicine (formerly, Institute of Medicine) called for enhanced monitoring of sodium in packaged foods, including voluntary initiatives such as the National Salt Reduction Initiative and sodium-reduction pledges by companies (Poti et al., 2017). In 2000-14, despite significant reductions in sodium from packaged food purchases, most U.S. households still bought foods and beverages with excessive sodium density, suggesting that further progress is needed to reduce sodium content of purchases.

Efforts to reduce sodium content underscore the typical challenge food companies face in improving the nutritional quality of the food supply. The biggest obstacles to creating reduced-sodium foods include taste and cost (IOM, 2010; Toops, 2012). Food manufacturers may choose to reduce sodium gradually because precipitous reductions may lead to noticeable taste changes and lost sales as consumers switch to other products (Gelski, 2014b).[1] Companies may also avoid advertising sodium reductions (e.g., on-package low-sodium claims) to avoid consumer perceptions that the products are less tasty (Gelski, 2013). Manufacturers have experienced product failures when attempting to market foods with claims of reduced sodium content (IOM, 2010).

From a cost standpoint, companies may require more time to develop lower sodium foods. Salt is a relatively inexpensive ingredient, and appealing substitutes may cost more (IOM, 2010). The search for sodium replacements has not been as successful as searches to replace other nutrients of concern, such as sugar with artificial sweeteners (IOM, 2010). Besides imparting flavor, sodium serves several functions, including increasing shelf life, preventing bacteria growth, and improving texture and appearance, which can raise the costs of removing salt from some products. The roles sodium plays may vary by food and beverage category.

This report relies on retail scanner data to document the nature and extent of food and beverage product creation and destruction in the United States. Special attention is given to the implications for measuring nutritional content of individual product categories. The major objectives are twofold. First, we examine product entry and exit patterns in 17 food and beverage product categories—in terms of numbers of new and obsolete products. Second, we compare the nutritional content of products entering and exiting the market to determine if products introduced were nutritionally superior to those products being replaced.

[1]Bread and processed meats are the biggest contributors to salt intake. For these product categories, Jaenke et al. (2017) find evidence suggesting that salt can be significantly reduced without jeopardizing consumer acceptability.

Defining "New Products"

The concept of a "new" food product varies widely. Some researchers posit there are no truly "new" food products, while others estimate there are several thousand new foods each year (Connor, 1981). New product attributes generally differ only incrementally from existing attributes because firms view close facsimiles of established products as being less risky (Padberg and Westgren, 1979). The definition of "new" depends partly on perspective: manufacturers, retailers, and consumers may all differ on what constitutes a new product (Connor, 1981).

Innovation activities in the food industry can be analyzed using different methodologies. Market research firms such as Datamonitor and Mintel enlist field agents to search for new products based on their own definitions of what constitutes "new." According to Datamonitor's proprietary Product Launch Analytics database, new products include those with new flavor(s), new size or type of package, new availability in a particular country, significant reformulation (e.g., that changes the nutritional profile), new name—and products that are part of an entirely new line. Mintel's proprietary Global New Products Database defines "new" to include new product lines, new varieties (e.g., flavor), new packaging, new formulations, and relaunches.

Other market researchers have used more restrictive definitions of "new." Gallo (1995) excludes line and brand extensions (e.g., different flavors and sizes, new packaging, and formulations). A study by Prime Consulting Group (1997) included only classically innovative products (ones that create new categories), new category entries, and line extensions (an item in the same product category with the same brand name) in their definition. This definition excludes seasonal items, copies of existing items, and new package sizes.

Given the many highly subjective views on "new," we settled on the definition of Broda and Weinstein (2010), who consider a new product to be any product that is different enough from existing products to warrant a new universal product code (UPC).[2] This provides an objective and convenient measure of new products (Lee and Schluter, 2002). Minor changes to an existing product, such as changes in package size, flavor, or formulation, are included in this definition. It may also include truly novel changes, such as products marketed in a new way or products that contain new ingredients that offer benefits not previously provided. Hence, we do not distinguish among new products by the degree of innovation.

[2]In order for a retailer to properly identify a manufacturer's products in the retailer's inventory system, a different UPC barcode is required for each product. For example, two flavors of bottled water in small, medium, and large will need six different UPC codes. The UPCs are provided by GS1 US, a nonprofit group that sets standards for international commerce. Companies pay to join GS1 US, and each member is assigned its own identification number that appears as the first part of its UPC. Companies must pay a membership fee, plus annual renewal fees, which depend on gross sales revenue and the number of unique products to be identified (Dow Jones & Company, 2008).

Data Description

This study uses IRI store-based scanner data, referred to as InfoScan, from 2008 to 2012 (Muth et al., 2016; see also Appendix A). IRI enters into agreements with retail establishments, which provide IRI with weekly retail sales and quantity data for products with UPCs and for random-weight (or perishable) products. IRI classifies the stores by format (or channel) as grocery, drug, convenience, mass merchandiser, club, dollar, and defense commissary stores.

Some of the available InfoScan data are at the store level, while other data are at the retail marketing area (RMA) level, depending on what level the retailer approves its release. RMA retailers provide weekly UPC level sales and quantity data; however, the data are aggregated across all stores within the RMA. InfoScan includes two components, which IRI calls the "census" and sample components. "Census" stores are retailers that provide IRI with sales data for all of their store locations. The remaining stores, known as the sample component, are randomly selected by IRI, which then enters into agreements with the retailer to receive data from the selected stores. Because IRI does not sell its sample component, the InfoScan data used in this study include only the "census" component. The "census" component of InfoScan is essentially a convenience sample—it includes data from as many retailers as IRI can get to participate. As a result, InfoScan data may not necessarily represent all retailers in the United States.

The current analysis also uses IRI's product dictionaries, which provide detailed information about the attributes of each UPC found in InfoScan. In addition to product category, brand, size, packaging type, flavor, and other basic product attributes, the product dictionaries also contain nutritional information from the nutrition facts panel and health/marketing claims included on the product packaging for some UPCs. Examples of health and marketing claims include "organic," "no added sodium," and "low sugar."[3] Muth et al. (2016, p. 37) note that only about 41 percent of the UPCs in InfoScan have at least some nutrition/claims data. However, these products account for 81 percent of total sales in the InfoScan data.

The product dictionaries contain significantly less detailed information for random-weight products (typically sold by weight) than is the case for products with UPCs. Because our analysis focuses on products' nutritional content and nutritional information is not available for random-weight products, we exclude them from our analysis.

The IRI dictionary files contain all products active in the InfoScan data from 2008 to 2012. For this reason, the dictionary data must be matched to the other datasets to determine which UPCs were sold in a particular year. It is not feasible to determine whether a product was reformulated or relabeled over time because only the most recent product attributes associated with a UPC are included in the dictionary. Hence, we are not able to identify reformulated products or those with changes made to their labeling during a given year that retained the same UPC.[4]

[3]A more detailed list of nutrition and claims information available in the IRI product dictionaries can be found in table 11 on page 36 of Muth et al. (2016).

[4]Broda and Weinstein (2010) maintain that "it is reasonable to assume that all goods with different UPCs differ in some way that might cause consumers to pay a different price for them and that it is rare for a meaningful quality change to occur that does not result in a change of UPC" (p. 695). This is because of the low financial costs of registering new products and the need to help retailers and consumers identify products sold and purchased. Therefore, if some noticeable characteristic of a product changes, it is likely that the UPC changes.

Product Entries and Exits

New product introductions are defined as the number of new UPCs, or products that were sold in year *t* by at least one store and that were not sold at any store in year *t-1*. Because we equate new products with new UPCs, any slight modification of an existing product that warrants a new UPC, such as packaging modification, counts as a new product. It is likely, however, that a product unique enough to be assigned a new UPC code differs from existing products in some noticeable characteristic (Broda and Weinstein, 2010). Likewise, products that exit the market, or disappearing UPCs, are defined as products that are sold in year *t-1* in at least one store and that were not sold at any store in year *t*.

Broda and Weinstein (2010) note that while *t* could theoretically be defined using any measure of time (e.g., quarters, months, weeks), using years avoids the possibility of products that have seasonal patterns from potentially distorting the measures of product turnover. Examples of products that may exhibit a seasonal pattern include turkey, cranberry sauce, eggnog, ham (a common meal for Easter), and candy corn. While these products are all available year round, it is common for stores to carry a wider selection of these products during their respective seasons, which would affect calculations of product turnover if *t* was defined as a period shorter than 1 year.

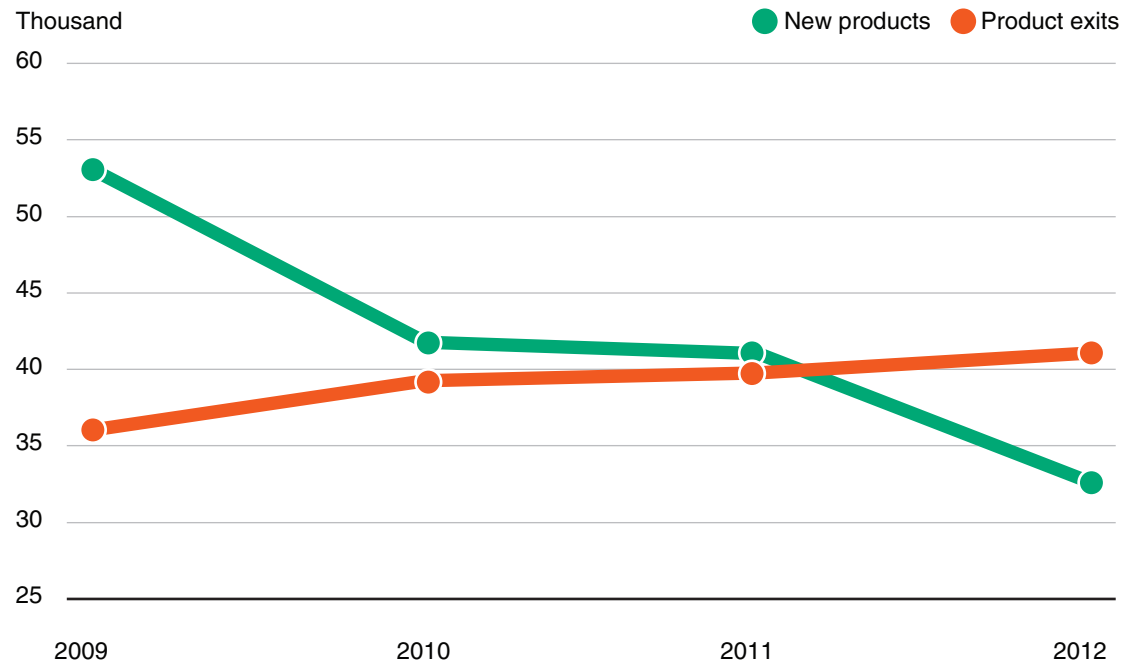
In some cases, a product may be temporarily out of stock or may not sell in a particular period. Hence, a product may have positive sales in one period, zero sales the following period, then positive sales again in the next period. Because our definition of new and exiting products is based on information about UPCs in the prior year, 2009 is the first year available for identifying these products over the 2008-12 period. The shares of products that exit the market in a given year and reappear in later years range from a low of 0.85 percent for baby food products to a high of 4.28 percent for dairy products (excluding yogurt) for the 17 product categories included (see Appendix B and Appendix table 1). When weighted by sales, the values of these products that re-enter the sample after disappearing (i.e., "false" entries and exits), as shares of the sales value of all products that entered or exited the market, range from 0.08 percent for bakery products (excluding bread) to 1.02 percent for snacks (e.g., chips, nuts, jerky, snack bars, rice cakes, snack rolls). We exclude products with false entries and exits from our analysis.[5]

Numbers of Product Entries and Exits

Introductions of food and beverage products in 17 product categories showed a steady downward trend, while exits increased, albeit at a declining rate (fig. 1). By 2012, the number of products exiting the market exceeded the number of new products. Consequently, the total number of UPCs sold in a given year grew by less than 1 percent in 2010 and 2011, before falling in 2012 (fig. 2). The average net change in UPCs was only -0.13 percent per year.

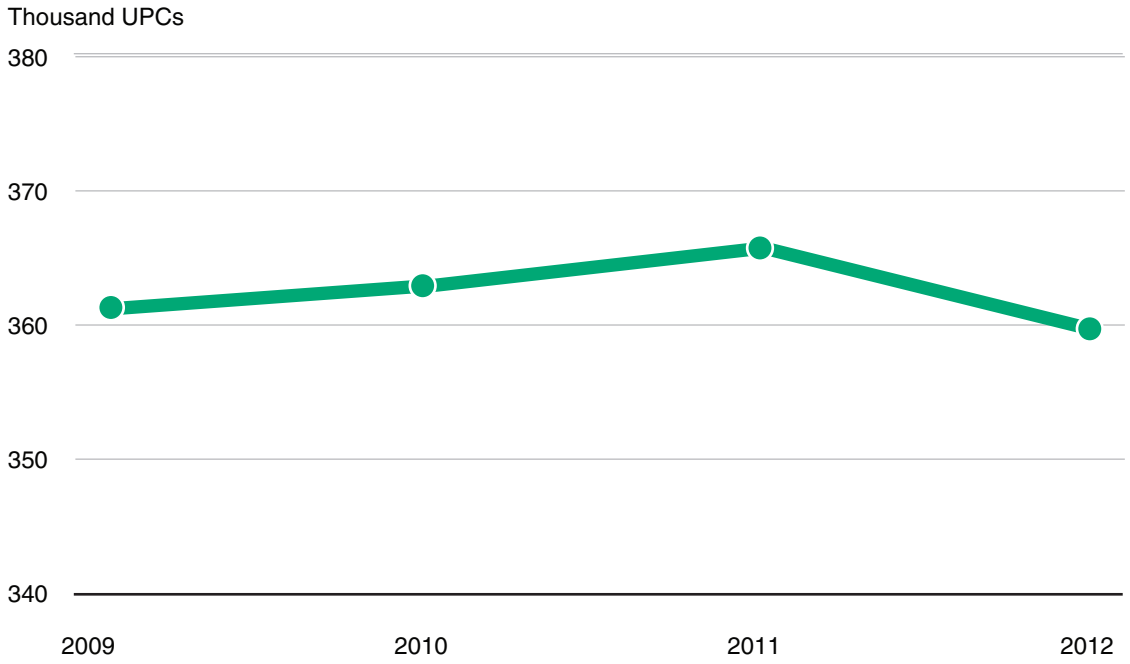
[5]Products that enter and exit in the same year (year *t*) are considered to be an entry in year *t* and an exit in year *t+1*. We are able to evaluate the number of such products in years 2009, 2010, and 2011. For each of the five product categories that we include in our nutritional analysis (discussed in a later section), we measure the number of products that were present in only 1 year from 2009 to 2011. Products that exist in only 1 year account for between 1.0 percent (frozen/refrigerated meals) and 2.7 percent (candy) of all UPCs that existed in the product category in 2009-11. Given the small share of all products represented by products that existed in only 1 year, we expect them to have a marginal effect on our nutritional analysis.

Figure 1
Number of entering and exiting food and beverage products, 2009-12



Note: Walmart first appears in the IRI data in 2009.
Source: IRI InfoScan data.

Figure 2
Total number of UPCs, 2009-12

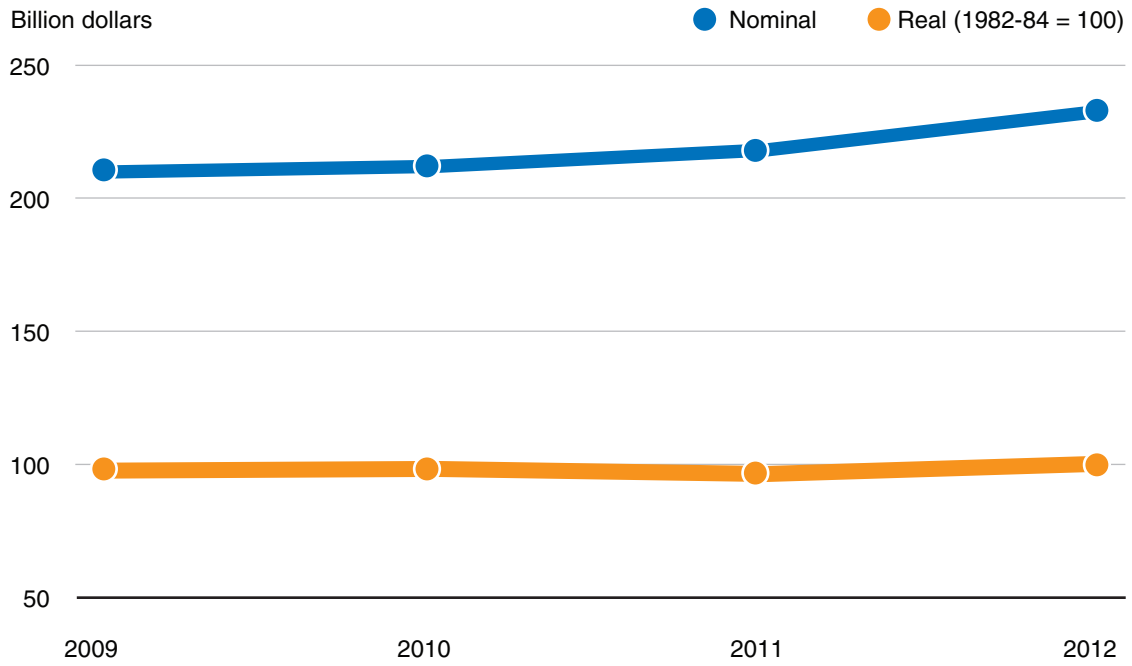


Note: UPC = universal product code. Walmart first appears in the IRI data in 2009.
Source: IRI InfoScan data.

Figure 3 shows sales of all UPCs deflated by the consumer price index (CPI) for food at home with base period 1982-84=100. The decline in new product introductions corresponds to stagnant real sales. Walmart first appears in the IRI data in 2009, which accounts for a portion of products entering the data in 2009.[6]

Product categories with increasing shares of new products reflect more product modifications. Three categories—candy, snacks, and beverages—accounted for over a third of the introductions (table 1). Industries with the most new products are generally characterized by moderate-to-high levels of concentration (share of sales accounted for by the largest companies), while those product classes with very high concentration have fewer new product introductions (Connor et al., 1985). Few products were introduced in the baby food industry, where three firms accounted for 93 percent of sales in 2008 (Chen, 2009).

Figure 3
Total sales of UPCs, real dollars and nominal, 2009-12



Note: UPC = universal product code. Walmart first appears in the IRI data in 2009. "Total sales of UPCs" is the sales value all UPCs contained in the InfoScan data for the 17 product categories.

Source: IRI InfoScan data.

[6]In 2009, 6,536 UPCs, across all food and beverage categories, were sold exclusively at Walmart. This suggests that the inclusion of Walmart in the data accounts for less than 13 percent of the 53,000 new products in 2009 for the 17 product categories included in this study. Assuming that all of the UPCs sold only at Walmart were in these 17 categories, then the inclusion of Walmart accounts for 38 percent of the net increase in UPCs (entries minus exits) in 2009. For 2010-12, we also evaluate the number of participating retailers added to the IRI data in each year, along with the number of new stores for each retailer. There are two instances where more than 28 stores were added to the data. First, 838 *ampm* convenience stores entered the data in 2010. There were 269 UPCs, across all food and beverage categories, sold exclusively at *ampm* convenience stores. In 2010, these UPCs accounted for only 0.6 percent of the 42,000 new products for the 17 product categories. The second potential issue is with the 261 defense commissary stores that entered the data in 2011. There were 2,460 UPCs sold exclusively at these stores. In 2011, the UPCs accounted for less than 6 percent of the 41,000 new products in the 17 product categories. Given the small share of new products that resulted in adding stores to the data after 2009, eliminating these stores would likely have had only a minor effect on our results.

Table 1
Food and beverage product entries by product category, 2009-12[1]

Categories	2009	2010	2011	2012
All products (number)	53,061	41,763	41,017	32,600
Candy	13.0	12.9	13.2	13.4
Snacks	12.0	12.0	13.3	12.6
Beverages	10.9	10.3	10.4	9.5
Condiments and sauces	6.9	7.7	7.0	7.4
Frozen/refrigerated meals	7.0	7.0	6.9	7.2
Processed meat	7.4	6.6	7.3	7.1
Baking ingredients	6.4	6.4	6.4	6.6
Fruits and vegetables	5.1	6.0	5.7	6.5
Shelf-stable meals	6.7	6.2	6.5	6.3
Dairy products (excluding yogurt)	5.1	5.2	5.6	5.5
Desserts	4.4	3.6	4.1	4.6
Bakery items (excluding bread)	6.2	8.0	4.9	4.2
Bread products	3.7	3.6	3.1	3.3
Breakfast cereals	2.3	1.9	1.8	2.2
Yogurt	1.4	1.2	1.7	1.6
Nutrition/weight-loss foods	0.7	0.8	1.5	1.1
Baby food	0.8	0.6	0.7	1.0

[1]Percent of total.
Source: IRI InfoScan data.

Measures of Product Entry and Exit Rates

We use the following statistics to measure the extent of product entry and exit. Following Broda and Weinstein (2010), entry and exit rates in year *t* relative to year *t-1* are defined as

$$(1)\ \text{Entry Rate}(t,\ t\text{-}1) = \frac{\text{New UPCs}(t,\ t\text{-}1)}{\text{All UPCs}(t)} \times 100$$

$$(2)\ \text{Exit Rate}(t,\ t\text{-}1) = \frac{\text{Disappearing UPCs}(t,\ t\text{-}1)}{\text{All UPCs}(t\text{-}1)} \times 100$$

where "All UPCs(*t*)" is the total number of products sold in period *t*.

Product entry and exit rates weighted by their sales value, or creation and destruction are defined as

$$(3)\ \text{Creation}(t,\ t\text{-}1) = \frac{\text{Value of New UPCs}(t,\ t\text{-}1)}{\text{Total Value of All UPCs}(t)} \times 100$$

$$(4)\ \text{Destruction}(t,\ t\text{-}1) = \frac{\text{Value of Disappearing UPCs}(t,\ t\text{-}1)}{\text{Total Value of All UPCs}(t\text{-}1)} \times 100$$

Table 2 summarizes the median of annual product entry and exit rates (Appendix B, Appendix table 2) and creation and destruction (Appendix B, Appendix table 3) for all product categories. Median product entry rates range from 8 percent for condiments and sauces and baking ingredients to 17 percent for candy and nutrition/weight-loss foods (e.g., powder shake mixes, nutrition bars, energy gels). Median exit rates indicate that between 7 percent (baking ingredients) and 18 percent (candy) of products were not available in the current year, but were available in the previous year. For most product categories, the entry rate exceeds the exit rate, indicating an increase in product variety.

Changes in product characteristics within a category are generally associated with higher product turnover rates, which we define as the sum of entry and exit rates (Broda and Weinstein, 2010; de Figueiredo and Kyle, 2006; Aghion et al., 2013).[7] These include any modifications, including reformulations to improve nutrition, flavor, or texture; more convenient packaging or package-size changes; and more innovative changes. Based on table 2, which is sorted by turnover, categories with the highest product turnover include candy, nutrition/weight-loss foods, bakery items (excluding bread), yogurt, and snacks. Those with the least turnover include fruits and vegetables, shelf-stable meals (e.g., soup, pasta, canned meat), condiments and sauces, dairy products (excluding yogurt), and baking ingredients.

Table 2
Product entry and exit (percent) by product category, 2009-12[1]

Category	Entry rates[2]	Exit rates[2]	Turnover[2]	Creation[2]	Destruction[2]
Candy	16.9	17.9	35.1	9.2	1.0
Nutrition/weight-loss foods	16.8	16.0	32.9	6.4	0.2
Bakery items (excluding bread)	15.5	14.7	30.6	7.4	0.9
Yogurt	16.0	14.2	30.6	8.2	1.0
Snacks	15.1	13.4	28.5	10.4	0.3
Breakfast cereals	13.3	13.7	28.2	6.9	0.2
Baby food	14.3	11.4	25.5	5.0	0.0
Frozen/refrigerated meals	13.2	12.1	25.3	5.0	0.3
Processed meat	12.4	12.0	24.3	4.9	0.6
Desserts	10.8	12.0	23.3	6.2	0.2
Beverages	11.7	10.2	21.8	3.0	0.1
Bread products	9.5	9.9	19.7	3.1	0.7
Shelf-stable meals	9.1	8.8	16.9	2.6	0.1
Fruits and vegetables	9.1	8.2	16.8	2.9	0.3
Condiments and sauces	8.1	8.5	16.7	2.4	0.2
Dairy products (excluding yogurt)	8.5	8.3	16.0	3.1	0.5
Baking ingredients	7.9	7.5	15.4	3.7	0.1

[1]Sorted in descending order based on median product turnover rates (entry rate plus exit rate) over the 2009 to 2012 period.
[2]Median over the 2009 to 2012 period.
Source: IRI InfoScan data.

[7]Broda and Weinstein (2010) define "turnover" as the sum of creation and destruction. Using this definition, there is little variation in turnover rates across product categories. For this reason, we use the unweighted analog of creation and destruction for our measure of product turnover. Turnover will be one of the criteria used in our selection of product categories for the nutritional analysis discussed in the following chapter.

The value of products introduced in year *t* as a share of total expenditures in year *t* ranged from 2 percent for condiments and sauces to 10 percent for snacks (table 2). There is little variation in the value of products that exited in year *t* as a share of total UPC sales in year *t-1*, equaling either 0 (after rounding) or 1 percent. For each product category, the fact that creation exceeds destruction suggests that new products were displacing market share from products common in periods *t* and *t-1* (Broda and Weinstein, 2010).

Implications for Nutritional Content of Select Product Categories

In this project, we use IRI retail store data to compare differences in average nutritional content of products that were entering, exiting, and established (i.e., neither entered nor exited).[8] Our data describe the nutritional content of new products in five food and beverage categories: breakfast cereals, yogurt, snacks, candy, and frozen/refrigerated meals (e.g., entrees, side dishes, frozen sandwiches, pizza, and casseroles). We select these categories based on two criteria. First, they were active in product innovation as reflected by product turnover rates, ranking in the top half among all categories (see table 2). Second, each of these categories had a relatively high share of products with no missing nutrition information for the nutrients examined in its product category.

For the top 11 categories in product turnover listed in table 2, the shares of products with complete nutrition information in 2008-12 ranged from 29 percent for frozen/refrigerated meals to 47 percent for yogurt. In contrast, 21 percent of bakery items (excluding bread) and 13 percent of nutrition/weight-loss foods had complete nutrition information.[9] Except for yogurt's share, in 2008-12, the shares of total sales accounted for by products with complete nutritional profiles were much higher, ranging from 79 percent for snacks to 96 percent for breakfast cereals. When weighted by sales, yogurt products with complete nutrition information accounted for only 43 percent of total yogurt sales.[10]

We conduct independent sample t-tests to explore differences in the average nutrient composition of new products compared to both established products and those exiting the market.[11] The nutritional analysis of the five product categories focuses on nine key components flagged by the *2015-2020 Dietary Guidelines for Americans* (DGA, 2015) either for limiting (sodium, sugar, saturated fat,

[8]Only a portion of the products entering the market will represent new products containing different levels of nutrients or reformulations of existing products. In this study, we compare differences in the average nutritional content of new UPCs without distinguishing the type of innovation (e.g., changes in flavor, packaging, etc.).

[9]Although 42 percent of baby food products had non-missing nutrition information and ranked among the top categories in product turnover, we are unable to find a suitable "reference amount customarily consumed per eating occasion," for standardizing serving sizes.

[10]Muth et al. (2016) compare IRI nutrition data against an alternative online nutrition dataset from Gladson (market research firm), which connects a product's UPC with information on the product's nutritional composition but lacks sales data. Based on comparisons in 2012, Muth et al. conclude that supplementing IRI nutrition data with Gladson nutrition data could improve overall coverage, but would require careful analysis to construct the combined dataset. As noted in Muth et al. (2016) (footnote 35), the authors plan to estimate hedonic price equations to better understand whether differences in the coverage of products in Gladson and IRI lead to different results. A separate project at USDA's Economic Research Service (ERS) is underway to match nutrition data from USDA's Food and Nutrient Database for Dietary Studies (FNDDS) to UPCs in the IRI data. Given the complexities involved in matching and comparing nutrition data in the IRI data to other datasets, such analyses are beyond the scope of our report.

[11]The purpose of the t-test is to test the null hypothesis that the differences between the mean nutrient content of two groups are equal. The t-statistic is the difference between the mean nutrient content of the two groups relative to the variation in the data. The size of the t-statistic corresponds to a p-value, which is the probability that the difference between two sample means, X, is equal to X, given that the population means are equal. When the p-value is sufficiently small, the difference is said to be statistically significant. Common significance levels used to accept or reject the null hypothesis include 10 percent, 5 percent, and 1 percent. If the p-value lies between 0.10 and 0.05 or 0.05 and 0.01, the null hypothesis of equal means is rejected at the 10-percent or 5-percent level of significance, respectively. The null hypothesis is rejected at the 1-percent level of significance if the p-value is equal to or less than 0.01. See, for example, Kim (2015) for a more detailed discussion of "t-tests" and "significance." We also compare the nutritional content in individual years, but the sample sizes of entering and exiting products are too small to test for statistical significance.

trans fats, cholesterol, and calories) (chapter 1) or for increasing (fiber, calcium, and iron) (chapter 2).[12] Low intake of iron is of special concern for young children, women of childbearing age, and women who are pregnant. Except for frozen/refrigerated meals, few products were identified as containing trans fats, so trans fats were excluded for all other product categories. Because we omitted nutrients for which there were insufficient observations, only three nutrients are examined for the candy category.[13] Nutrients were standardized based on "reference amounts customarily consumed per eating occasion," which vary by product category, to control for variations in serving size (DGA, 2015).[14] We then consider the implications of product turnover for the average nutritional quality of the category as a whole in 2008-12.

Breakfast Cereals

Regarding nutrients that should be consumed in moderation, in 2009-12, cereal products entering the market contained statistically significantly lower levels of sodium and sugar per serving than exiting products contained (table 3). However, entering cereal products also contained more saturated fat than did exiting products. Only seven cereal products in the data are identified as containing trans fats. However, this does not suggest that trans fats have been nearly eliminated. The U.S. Food and Drug Administration (FDA) allows Nutritional Facts panel to read "0 grams of trans fats" if the product had less than 0.5 grams of trans fats per recommended serving (Rahkovsky et al., 2012).[15] In addition, only 27 breakfast cereal products were identified as containing cholesterol.

Among the nutrients that should be increased, fiber was statistically significantly higher in entering than in exiting cereal products, while calcium levels were lower. Consumers' interest in healthier foods corresponds to their willingness to pay for healthy attributes, such as fiber-rich whole grains (Crawford, 2015).[16] Forty-four percent of cereal products entering the market in 2009-12 carried a "whole grain" claim (e.g., "made with whole grain"), compared to 36 percent of exiting products and 38 percent of established products. This implied rise in whole grain claims followed publication of the 2005 *Dietary Guidelines for Americans*, which was the first version to make specific quantity recommendations for whole grain consumption (DGA, 2005). Fiber-related claims (e.g., "more fiber," "added fiber," "extra fiber") were made on 43 percent of new products, 31 percent of

[12]Vitamin D and potassium were also considered, but products had a higher number of missing observations for these nutrients.

[13]Candy had more products with information on calories (18,439 products), sodium (18,341 products), and sugar (18,227 products) than it had on any other nutrient. All other specific nutrients had at least 24 percent fewer observations than these three nutrients.

[14]One potential source of bias in our nutritional comparisons are changes in IRI's participating stores that may carry unique products that would appear as product entries in our analysis. As noted earlier, Walmart was the main entrant into the data in 2009. We calculated the number of UPCs sold exclusively at Walmart in 2009 that had complete nutrition information for each of the five categories included in our nutritional analysis. The entry of Walmart accounts for between 0.2 percent (yogurt) and 3.0 percent (candy) of all entering products with complete nutrition information in 2009-12 (tables 3-7). Given these relatively small shares, the addition of Walmart is likely to have only marginal effects on our nutritional comparisons. Another potential area where the entry of Walmart could affect our analysis is the average annual nutrient content of all UPCs in 2009 (figs. 4-12). UPCs sold exclusively at Walmart in 2009 account for a small share of all UPCs with complete nutrition information in 2009, ranging from 0.1 percent for yogurt to 2.0 percent for candy.

[15]A study of U.S. packaged foods in 2012 found that most products containing amounts of trans fats per serving up to 0.5 grams were listed as containing no trans fats (Clapp et al., 2014). In 2015, FDA finalized its determination that partially hydrogenated oils (PHOs), the primary dietary source of artificial trans fats in processed foods, are not "generally recognized as safe" (GRAS). Consequently, food manufacturers were given 3 years to remove PHOs from products.

[16]According to the Whole Grain Council's 2015 Whole Grains Consumer Insights Survey, 37 percent of whole grains were consumed at breakfast, and oatmeal and whole grain cold cereals ranked among the top five whole grain foods.

exiting products, and 30 percent of established products. New products carrying whole grain claims contained statistically significantly more fiber (3.1 grams per serving) than new products without the claim (2.1 grams per serving).

In some cases, sugar, salt, or fat is added to increase the palatability of whole grain foods (Golan et al., 2009). We find statistically significantly less sugar and sodium in products entering with a whole grain claim than those entering without the claim, while there is no difference in average saturated fat content. This finding suggests that the nutritional profile of new cereal products carrying a whole grain claim is not diminished with respect to these nutrients.

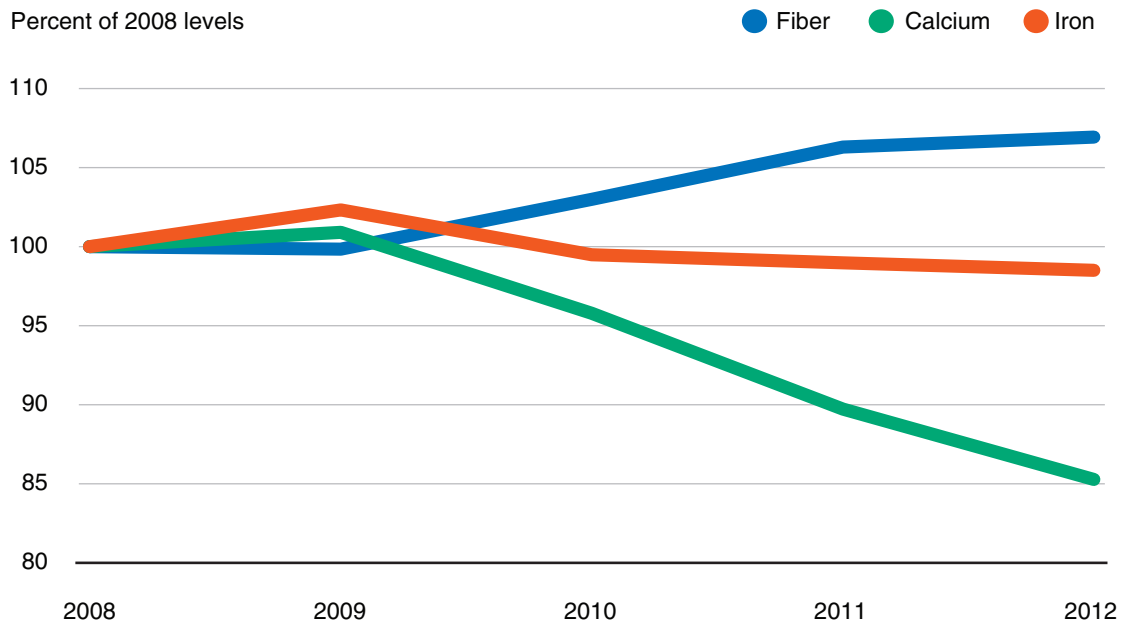
Differences in the average nutrient content of new and existing products are reflected in changes in average nutrient content of breakfast cereals over time. In 2008-12, average fiber content of all cereal products gradually improved as new products entered the market with higher levels of fiber than those exiting the market had contained (fig. 4). These results are consistent with Thomas et al. (2013), who find statistically significant increases in fiber and an increase in whole grain content of ready-to-eat (RTE) breakfast cereals in 2005-11.

Table 3
Average nutritional characteristics of breakfast cereal products entering the market versus exiting and established breakfast cereal products, 2009-12[1]

Nutrient[2]	Unit	Mean nutrient content				
		Entering (n = 2,015) (1)	Exiting (n = 2,151) (2)	Established[3] (n = 2,308) (3)	(1)-(2)[4]	(1)-(3)[5]
			Nutrients to limit			
Total calories	Calories	133.27	133.26	131.57	0.01	1.70***
Saturated fat	Grams	0.29	0.21	0.27	0.07***	0.01
Sodium	Milligrams	154.59	165.70	142.88	-11.11***	11.71***
Sugar	Grams	8.88	9.18	7.80	-0.30*	1.07***
			Nutrients to increase			
Fiber	Grams	2.58	2.26	2.51	0.32***	0.07
Calcium	% RDI	6.04	7.62	4.73	-1.59***	1.31***
Iron	% RDI	32.79	33.45	29.42	-0.65	3.37***

Note: RDI = Recommended daily intake. [1]A difference in average nutrient content that is statistically significant at the 0.10 level is indicated by *; ** at the 0.05 level; *** at the 0.01 level. [2]Amount per serving for a standardized 35-gram serving size. [3]Products that did not enter or exit. [4]Average amount for entering products minus average amount for exiting products. [5]Average amount for entering products minus average amount for established products.
Source: IRI InfoScan data.

Figure 4
Changes in nutrient content of all breakfast cereals for nutrients recommended to increase by the *Dietary Guidelines for Americans,* 2008-12



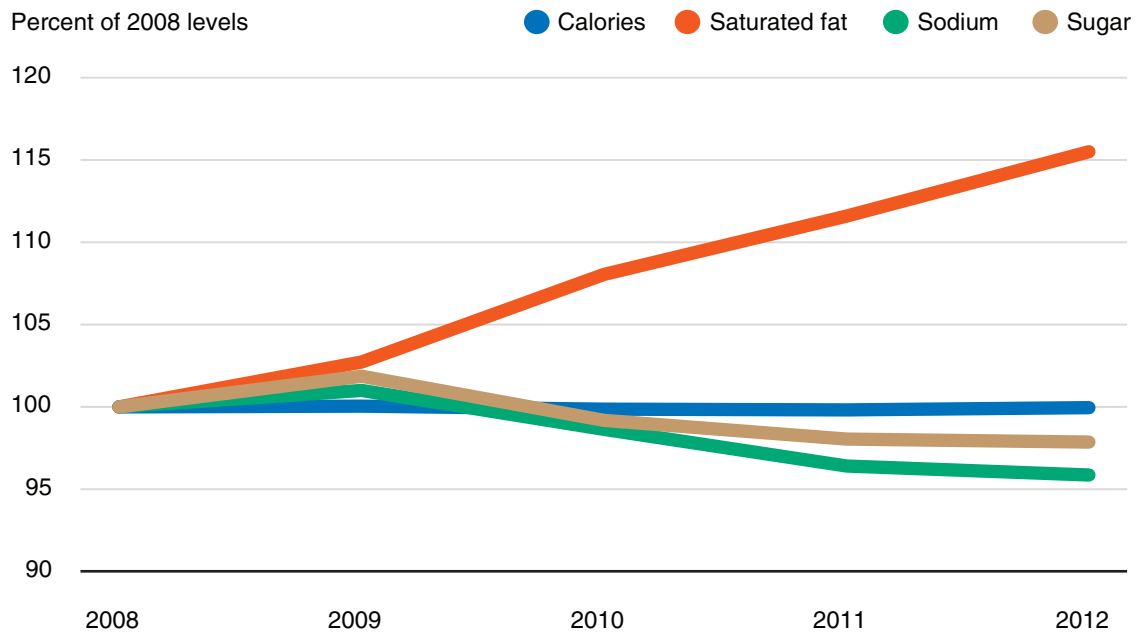
Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

Most notable, however, was the reduction in calcium content in cereal products, with 15 percent less calcium per serving on average in 2012 than in 2008. This finding may reflect declining interest by the industry in calcium fortification. Although 36 percent of cereal products entering the market met FDA's requirements for a calcium-related nutrient claim (e.g., "high," "good source of calcium," "enriched"), only 7 percent were marketed with such claims. A higher share of products exited the market carrying a calcium claim (16 percent), which corresponds to a reduced use of these claims. This finding suggests that returns to marketing products with a calcium claim were low.

Among nutrients to limit, the most notable changes are increases found in saturated fats as new products replaced exiting products (fig. 5). Saturated fat content increased by 15 percentage points in 2008-12. There was also a gradual reduction in average sodium content of cereal products over time.

Average sugar content fell by 2 percentage points in 2008-12 as products entered and exited the market with a statistically significant, but small difference in average sugar levels (3 percent less sugar in entering compared to exiting products). RTE cereals, in particular, have been scrutinized for high sugar content, especially those products marketed to children (Environmental Working Group, 2014). Over 83 percent of cereal products entering or exiting were RTE, and average sugar content was nearly identical for the two RTE cereal groups (9.507 grams per serving in entering products versus 9.500 grams per serving in exiting products). Results suggest that manufacturers made little progress in reducing the sugar content of RTE cereal in 2008-12. These results are also consistent with Thomas et al. (2013), who find no statistically significant change in sugar levels in RTE breakfast cereals in 2005-11.

Figure 5
Changes in nutrient content of all breakfast cereals for nutrients recommended to limit by the *Dietary Guidelines for Americans*, 2008-12



Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

Yogurt

Among the nutrients to limit, new yogurt products were less nutritious than exiting products with respect to three nutrients and were more nutritious with respect to one nutrient. The mean caloric content of entering yogurt products was statistically significantly higher than that of both exiting and established products (table 4). The mean content of saturated fat and cholesterol in entering yogurt products was statistically significantly higher than exiting products. On the other hand, the mean sodium content of entering products was statistically significantly lower than that of both exiting and established products. Only three yogurt products in the data are identified as containing trans fats.

For nutrients to increase, the mean fiber content of entering yogurt products is statistically significantly higher than that of both exiting and established products. New yogurt products entered with 47 percent more fiber per serving on average than exiting products and with 77 percent more fiber per serving than established products.

Table 4
Average nutritional characteristics of new yogurt products compared to exiting and established yogurt products, 2009-12[1]

Nutrient[2]	Unit	Mean nutrient content				
		New (n = 825) (1)	Exiting (n = 1,032) (2)	Established (n = 1,299) (3)	(1)-(2)[3]	(1)-(3)[4]
			Nutrients to limit			
Total calories	Calories	193.34	176.07	182.84	17.28***	10.50***
Saturated fat	Grams	1.62	1.19	1.46	0.43***	0.16
Sodium	Milligrams	118.17	128.17	129.94	-10.00***	-11.77***
Sugar	Grams	26.21	26.77	27.00	-0.56	-0.79
Cholesterol	Milligrams	11.98	9.73	11.42	2.26***	0.56
			Nutrients to increase			
Fiber	Grams	0.73	0.50	0.42	0.23***	0.32***
Calcium	% RDI	27.59	27.65	29.99	-0.07	-2.40***
Iron	% RDI	1.00	1.08	0.82	-0.08	0.19

Note: RDI = Recommended daily intake. [1]A difference in average nutrient content that is statistically significant at the 0.10 level is indicated by *; ** at the 0.05 level; *** at the 0.01 level. [2]Amount per serving for a standardized 225-gram serving size. [3]Average amount for new products minus average amount for exiting products. [4]Average amount for new products minus average amount for established products.
Source: IRI InfoScan data.

Traditional plain yogurt does not contain fiber, which suggests that manufacturers added it. There were 241 entering products (29 percent) that contained at least some fiber compared to 200 exiting products that contained any fiber (19 percent). The higher fiber content of entering products can be attributed, in part, to probiotics (beneficial bacteria that promote healthy digestion) because added fiber promote the growth of these bacteria.[17] Seventeen percent of yogurt products introduced in 2009-12 carried a probiotic health claim (e.g., "probiotic: supports immunity and digestive health," "probiotics to help maintain digestive health") compared to 10 percent of exiting products. New yogurt products with a probiotic health claim on the package contained twice as much fiber per serving on average as new products without the claim (1.25 grams versus 0.63 grams). Other sources of added fiber include yogurt toppings, such as granola and crushed cookies and candy bars containing nuts. New products identified as containing yogurt toppings accounted for 7 percent of all new yogurt products compared to 0.5 percent of exiting products. Products introduced with yogurt toppings contained nearly twice as much fiber per serving as those sold without toppings (1.33 grams versus 0.69 grams).

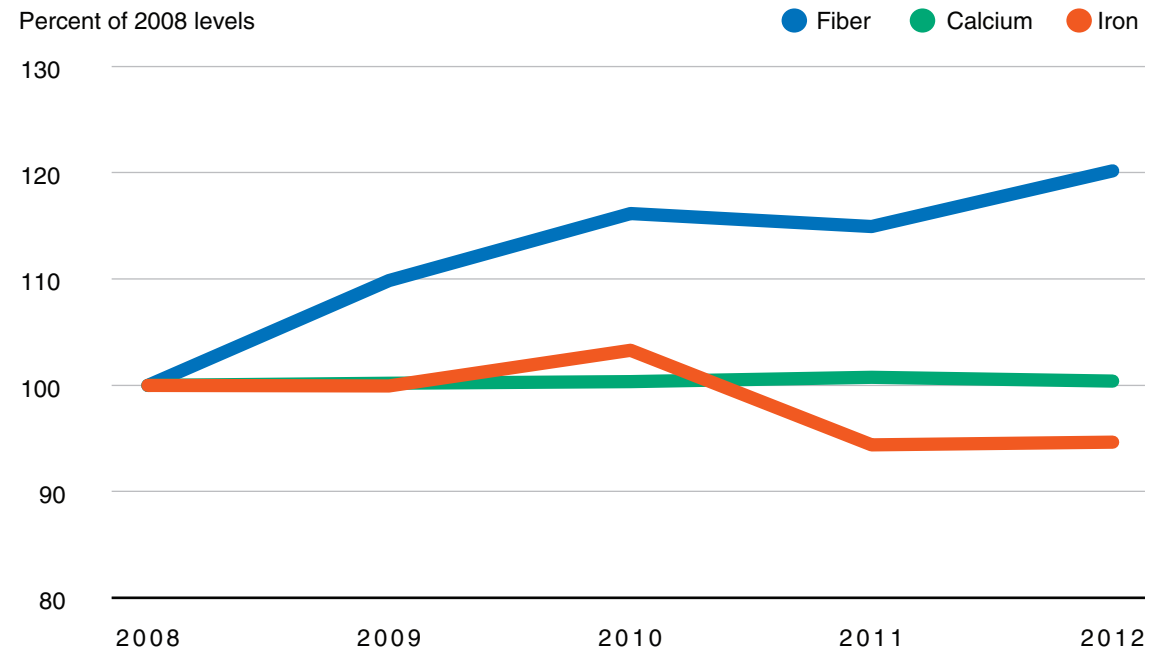
The yogurt category saw a 20-percentage-point increase in average fiber content per serving in 2008-12 as products entered with higher levels of fiber than those that exited (fig. 6). Excluding products with probiotic claims and those identified as containing yogurt toppings reduces the increase in fiber per serving to 7 percent, a 13-percentage-point reduction.

Among the nutrients to limit, saturated fat had the largest increase (14 percentage points), followed by cholesterol (9 percentage points) (fig. 7). Entering yogurt products replaced products containing more sodium, which corresponds to gradual reduction in average sodium content of 3 percentage points.

[17]Prebiotics are soluble fibers that contribute to the growth of probiotics. Manufacturers of probiotic yogurt primarily use inulin obtained from chicory root extract for their source of added prebiotic fiber (Group, 2014). In many food products promoted for fiber content, inulin may be found in the list of ingredients (Gelski, 2014a).

Figure 6

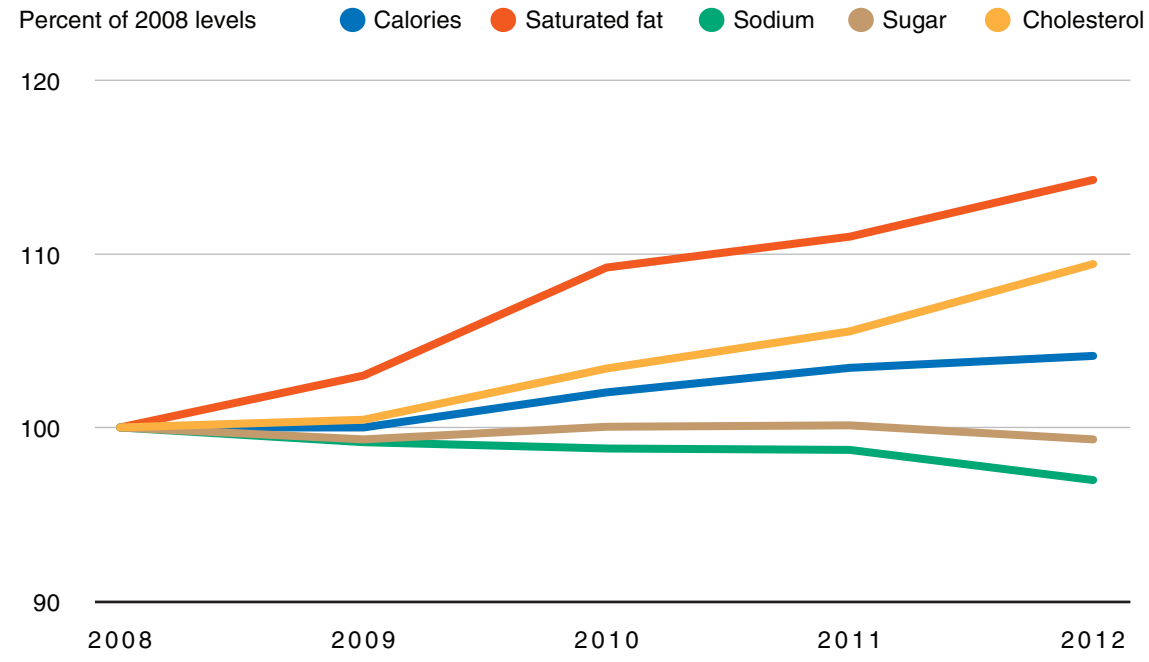
Changes in nutrient content of all yogurt for nutrients recommended to increase by the *Dietary Guidelines for Americans*, 2008-12



Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

Figure 7

Changes in nutrient content of all yogurt for nutrients recommended to limit by the *Dietary Guidelines for Americans*, 2008-12



Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

Snacks

In table 5, new snack products, compared to exiting products, showed statistically significant nutritional improvements for four nutrients, but nutritional declines for three nutrients. New products contained more fiber and less sodium, sugar, and cholesterol. They also contained statistically significantly less calcium and more calories and saturated fat.

Compared to established products, new products contained statistically significantly fewer calories, less sodium, and higher fiber, but also contained more sugar on average. Only 4.6 percent of snack products with non-missing trans fats content information are identified as containing trans fats.

As with breakfast cereals, sizeable reductions in calcium content (nearly 10 percentage points) occurred in 2008-12, as snack products entering the market contained less calcium than exiting products (fig. 8). Only 6.6 percent of entering snack products qualified for a calcium-related nutrient claim, and 1.4 percent actually carried the claim. In comparison, 9.4 percent of exiting products were eligible to carry a calcium claim, and 3.6 percent used the claim. Other nutrients in snack products changed less than 6 percent. Sodium showed a gradual decline of 4 percentage points (fig. 9).

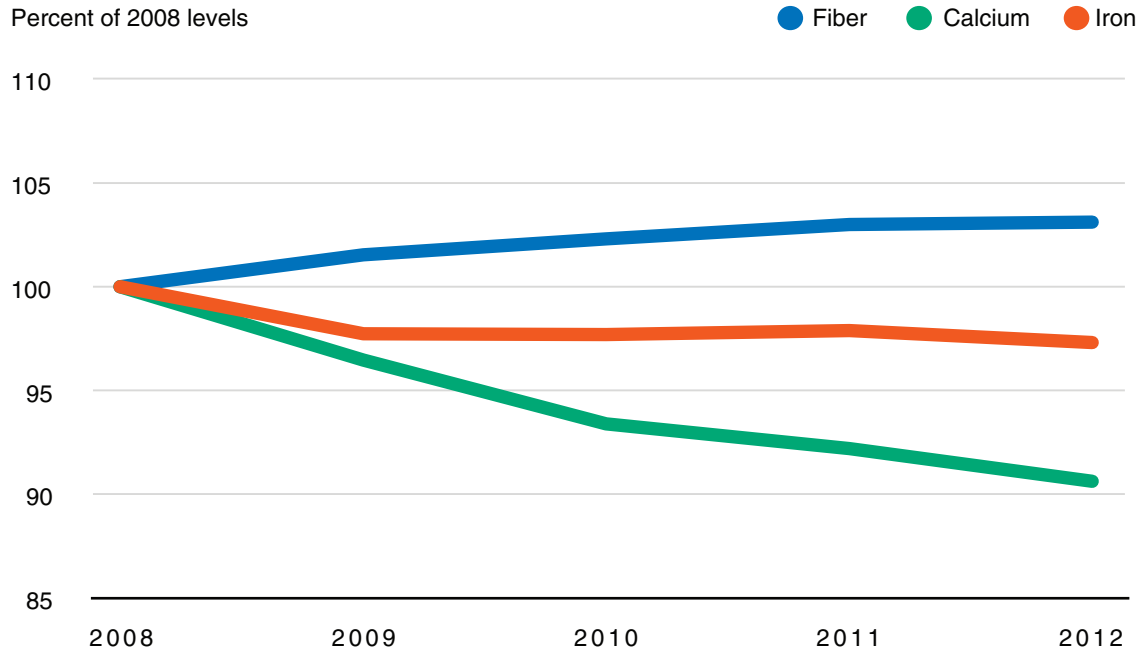
Table 5
Average nutritional characteristics of snack foods entering the market compared to exiting and established snacks, 2009-12[1]

Nutrient[2]	Unit	Mean nutrient content				
		Entering (n = 8,287) (1)	Exiting (n = 6,871) (2)	Established (n = 10,007) (3)	(1)-(2)[3]	(1)-(3)[4]
		Nutrients to limit				
Total calories	Calories	141.12	136.63	143.19	4.49***	-2.06**
Saturated fat	Grams	1.83	1.71	1.82	0.13***	0.02
Sodium	Milligrams	185.52	201.07	202.08	-15.56***	-17.00***
Sugar	Grams	4.13	4.34	3.29	-0.21**	0.86***
Cholesterol	Milligrams	2.42	2.77	2.42	-0.34**	0.00
		Nutrients to increase				
Fiber	Grams	1.65	1.54	1.58	0.11***	0.07***
Calcium	% RDI	2.73	3.17	2.66	-0.44***	0.10
Iron	% RDI	4.29	4.46	4.23	-0.17	0.06

Note: RDI = recommended daily intake. [1]A difference in average nutrient content that is statistically significant at the 0.10 level is indicated by *; ** at the 0.05 level; *** at the 0.01 level. [2]Amount per serving for a standardized 30-gram serving size. [3]Average amount for entering products minus average amount for exiting products. [4]Average amount for entering products minus average amount for established products.
Source: IRI InfoScan data.

Figure 8

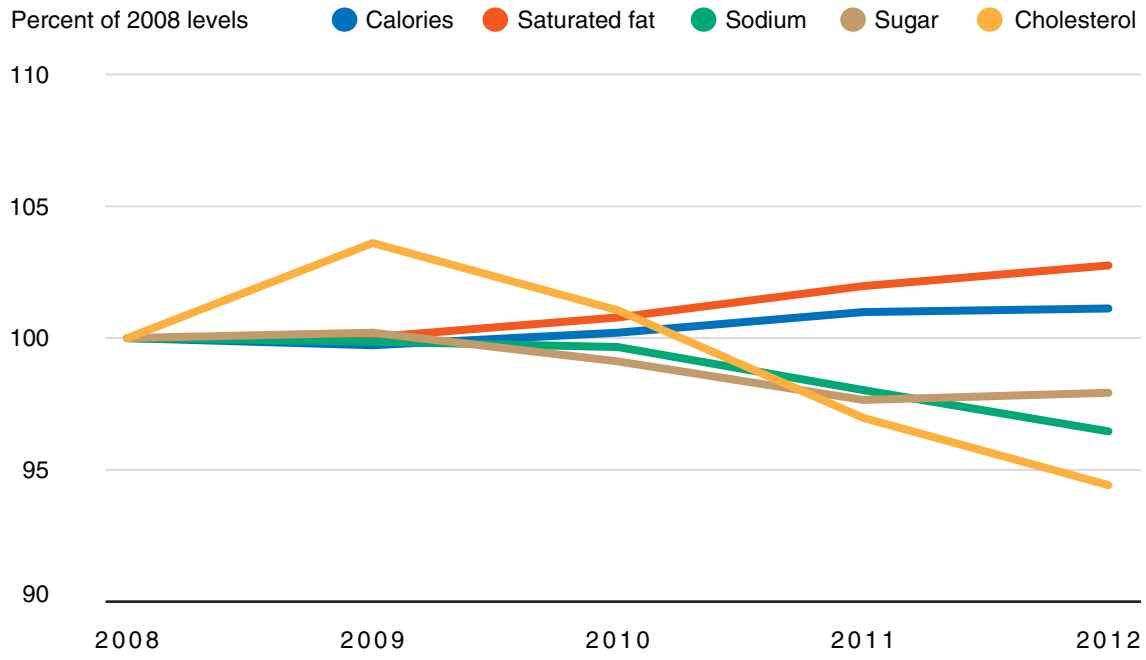
Changes in nutrient content of all snack products for nutrients recommended to increase by the *Dietary Guidelines for Americans*, 2008-12



Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

Figure 9

Changes in nutrient content of all snack products for nutrients recommended to limit by the *Dietary Guidelines for Americans*, 2008-12



Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

Frozen/Refrigerated Meals

Except for trans fats, products introduced in the frozen/refrigerated meals category contained statistically significantly higher levels of most nutrients to limit than both exiting and established products (table 6). Only 10.3 percent of frozen/refrigerated meals introduced were listed as containing trans fats. Sixteen percent of the products they replaced were identified as containing trans fats. Among the nutrients to increase, there was no statistically significant difference in average nutrient content between entering and exiting products.

Frozen/refrigerated meal items also underwent notable reductions (16 percentage points) in average trans fats per serving (fig. 10). This is likely the consequence of a mandatory disclosure regulation for trans fats on the nutrition label beginning in 2006, coupled with recommendations to limit trans fats consumption in the 2005 and 2010 *Dietary Guidelines for Americans* published by the U.S. Department of Health and Human Services (HHS) and USDA (Rahkovsky et al., 2012). Labeling regulations and Federal dietary guidance incentivized companies to lower the trans fats in their products. Eighty-seven percent of new frozen/refrigerated meal items were listed as containing no trans fats in 2009, compared to 90 percent in 2012.

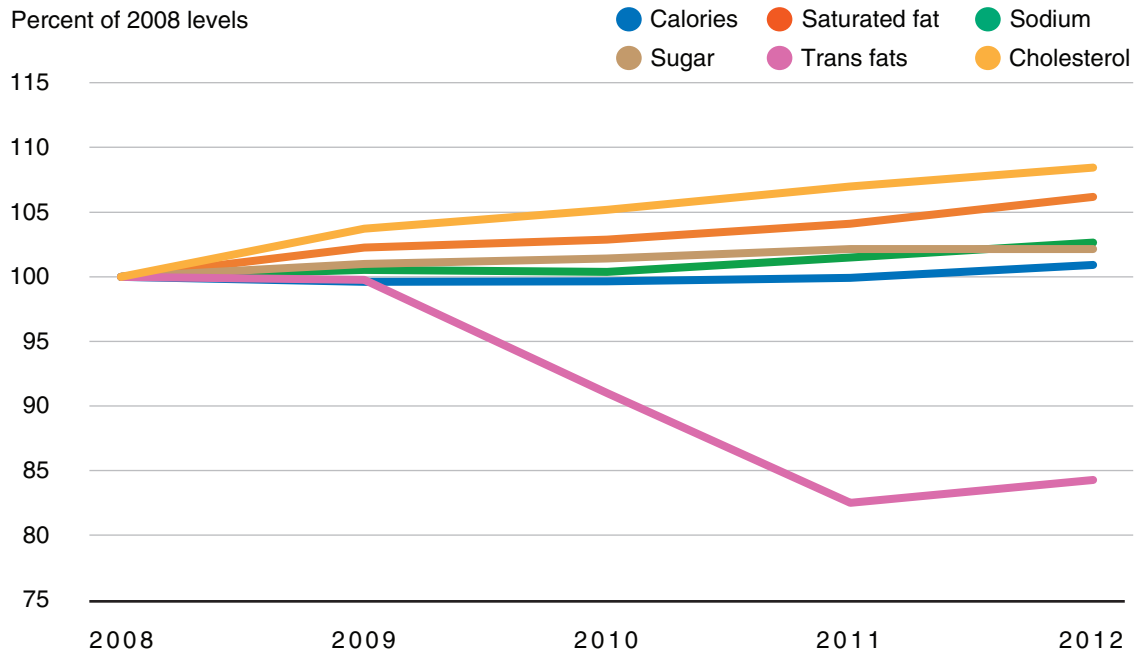
Table 6
Average nutritional characteristics of frozen/refrigerated meals entering the market compared to exiting and established frozen/refrigerated meals, 2009-12[1]

Nutrient[2]	Unit	Mean nutrient content				
		Entering (n = 3,733) (1)	Exiting (n = 1,729) (2)	Established (n = 4,723) (3)	(1)-(2)[3]	(1)-(3)[4]
		Nutrients to limit				
Total calories	Calories	287.93	279.49	284.56	8.44*	3.36
Saturated fat	Grams	4.45	3.98	3.86	0.47***	0.58***
Sodium	Milligrams	645.17	620.78	594.43	24.39*	50.74***
Sugar	Grams	5.82	5.72	5.34	0.10	0.48**
Trans fats	Grams	0.19	0.33	0.15	-0.14***	0.04**
Cholesterol	Milligrams	36.13	30.86	30.81	5.27***	5.32***
		Nutrients to increase				
Fiber	Grams	2.33	2.43	2.39	-0.10	-0.06
Calcium	% RDI	12.58	12.08	12.10	0.49	0.48
Iron	% RDI	11.49	11.82	12.20	-0.33	-0.71***

Note: RDI = recommended daily intake. [1]A difference in average nutrient content that is statistically significant at the 0.10 level is indicated by *; ** at the 0.05 level; *** at the 0.01 level. [2]Amount per serving for a standardized 145-gram serving size. [3]Average amount for entering products minus average amount for exiting products. [4]Average amount for entering products minus average amount for established products.
Source: IRI InfoScan data.

Figure 10

Changes in nutrient content of all frozen/refrigerated meals for nutrients recommended to limit by the *Dietary Guidelines for Americans*, 2008-12



Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

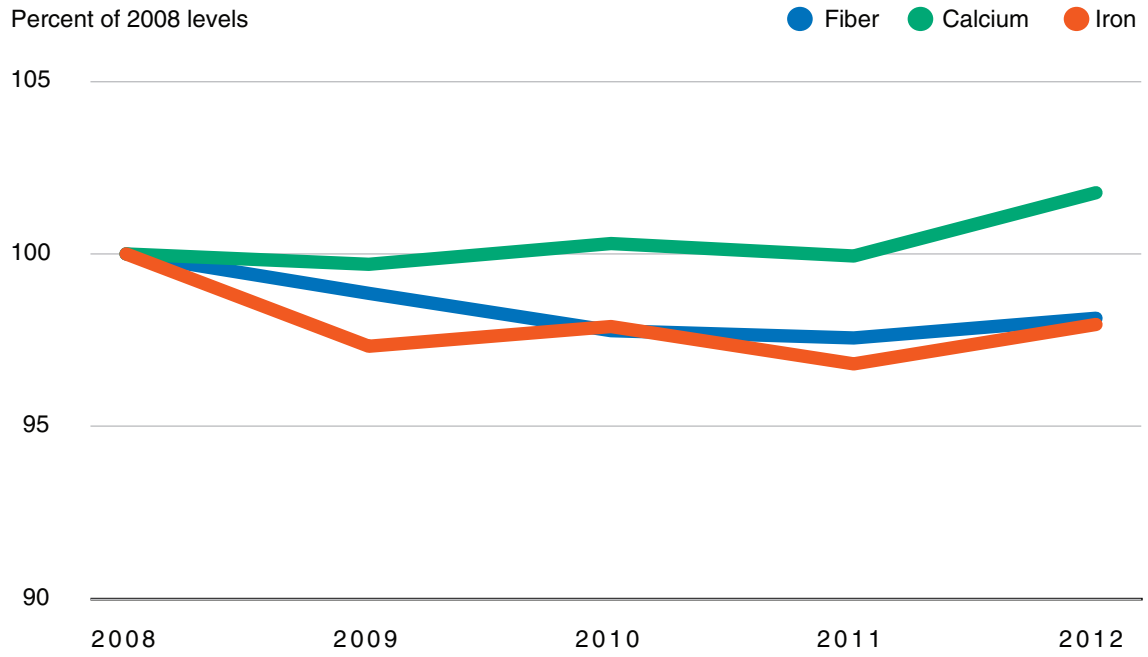
Smaller changes were found among the other nutrients. Average cholesterol content for frozen/refrigerated meal items increased by nearly 8 percentage points, as new products entered the market with higher levels than those exiting. Smaller percentage increases occurred in average saturated fat content.

Efforts to reformulate foods to reduce trans fatty acid content can have substantial repercussions for public health and public health policy. Some studies have found that when reformulating products, food manufacturers may replace trans fats with saturated fat to preserve the product's taste, albeit at the expense of health benefits (Stender et al., 2009). However, new frozen/refrigerated meal items listed as having no trans fats contained statistically significantly less saturated fat (4.2 grams per serving) than new products with trans fats contained (7.0 grams per serving). In addition, a positive, but small correlation is found between saturated fat and trans fats in new frozen/refrigerated meal items.[18] These results are consistent with several other studies finding that manufacturers have not compensated for reduced trans fats in new food items by increasing saturated fat (Rahkovsky et al., 2012; Mozaffarian et al., 2010).

One apparent contributor to increases in both cholesterol and saturated fat is breakfast products (a subcategory of frozen/refrigerated meal items), such as frozen waffles, breakfast sandwiches, frozen toaster pastries, and frozen pancake entrees. Entering breakfast products contained 60 percent more cholesterol per serving on average and 32 percent more saturated fat than all non-breakfast entries

[18]The correlation coefficient between saturated fat and trans fats content is equal to 0.15. A correlation coefficient measures the strength of relationship between two variables. It ranges from -1 to +1. A positive value suggests that both variables move together, while a negative value suggests that when one variable increases the other variable decreases. A correlation coefficient closer to zero means that the two variables are less correlated.

Figure 11
Changes in nutrient content of all frozen/refrigerated meals for nutrients recommended to increase by the *Dietary Guidelines for Americans*, 2008-12



Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

in the frozen/refrigerated meal category. Compared to breakfast products that exited, entering breakfast products contained 13 percent more saturated fat and 29 percent more cholesterol. Smaller differences were found in non-breakfast items in the frozen/refrigerated meal category, with entries containing 9 percent more saturated fat and 7 percent more cholesterol than exits.

Modest changes occurred in nutrients to increase (fig. 11). This finding corresponds to statistically insignificant differences in the nutrient content of products that entered and exited the market.

Candy

Newly introduced candy products contained statistically significantly smaller quantities of all three nutrients to limit than exiting products contained (table 7).[19] In addition, average calorie and sodium content were statistically significantly lower in new products than in established products. Only 4.5 percent of candy products with non-missing trans fats content information were identified as containing trans fats.

In 2008-12, the most notable change in the candy category was a 9-percentage-point drop in average sodium content as products containing higher levels of sodium exited the market (fig. 12). Most of the reduction occurred between 2008 and 2010, before leveling off. Sodium reductions to candy are not likely to result in significantly reduced sodium consumption, because sweets (including candy) contribute to only 5 percent of total daily sodium intake for people who are 2 or more years of age (IOM, 2010).[20]

[19]Nutrients to increase were excluded from the analysis because the share of products with missing nutrient information was relatively high.

[20]In addition to candy, sweets also include cookies, cakes, ice cream, pies, doughnuts, pastries, muffins, sweet rolls, puddings, jello, and popsicles.

Table 7

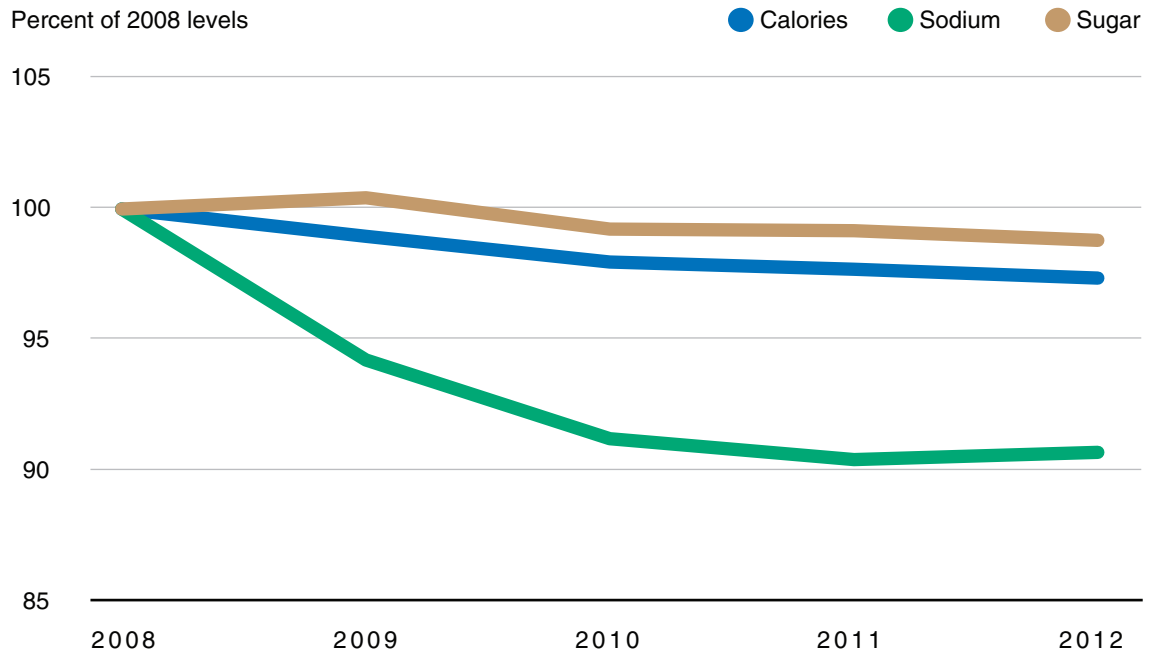
Average nutritional characteristics of candy entering the market compared to exiting and established candy, 2009-12[1]

Nutrient[2]	Unit	Mean nutrient content				
		Entering (n = 7,250)	Exiting (n = 5,164)	Established (n = 6,143)	(1)-(2)[3]	(1)-(3)[4]
		Nutrients to limit				
Total calories	Calories	148.22	155.15	151.84	-6.93***	-3.62*
Sodium	Milligrams	30.18	34.31	45.20	-4.13*	-15.02***
Sugar	Grams	19.97	20.50	20.08	-0.53*	-0.10

[1]A difference in average nutrient content that is statistically significant at the 0.10 level is indicated by *; ** at the 0.05 level; *** at the 0.01 level. [2]Amount per serving for a standardized 36-gram serving size. [3]Average amount for entering products minus average amount for exiting products. [4]Average amount for entering products minus average amount for established products.
Source: IRI InfoScan data.

Figure 12

Changes in nutrient content of all candy products for nutrients recommended to limit by the *Dietary Guidelines for Americans*, 2008-12



Note: *Dietary Guidelines for Americans* in the title refers to the 2015 version.
Source: IRI InfoScan data.

Small reductions were found in sugar and calorie content. Although the average sugar and calorie content of new products was statistically significantly less than that of exiting products in 2009-12, the differences were relatively small. Entering products averaged 4.5 percent fewer calories than exiting products and 2.6 percent less sugar than exiting products. In comparison, entering products contained 12.0 percent less sodium than exiting products.

Sodium Reductions in Food Products

Approximately 77 percent of sodium consumed is derived from salt added by manufacturers (DGA, 2005). On average, a single serving of an entering product in the breakfast cereal, snack, and frozen/refrigerated meals categories contained more sodium than foods considered to be low in sodium (less than 140 mg).[21] Most notably, new frozen/refrigerated meal items contained five times more sodium than the recommended 140-mg limit, while breakfast cereals and snack products exceeded the limit by 10 percent and 32 percent, respectively. On average, a single serving from a new frozen/refrigerated meal item contained 28 percent of the recommended maximum sodium intake per day (2,300 mg).[22] This category contains several foods that contribute the most sodium to Americans' diets, including chicken dishes (6.8 percent), pizza (6.3 percent), and pasta dishes (5.1 percent) (DGA, 2010).

For four of the five product categories examined (excluding frozen/refrigerated meals), the average sodium content per serving declined in 2008-12. However, less than 6 percent of new products were launched with a "low/no/reduced" sodium package claim. By category, "low/no/reduced" sodium package claims appeared on new products as follows: cereals (3.4 percent), yogurt (1.2 percent), snacks (5.3 percent), and candy (0.4 percent). Whether or not manufacturers chose to identify products as lower sodium products depends, in part, on the product type. Companies may tout nutritional improvements (such as lower sodium) in products aimed at health-conscious consumers but not in products considered indulgences (Jargon, 2014).

[21]According to USDA's 2005 *Dietary Guidelines for Americans*, foods low in sodium contain less than 140 mg per serving. This limit is also consistent with FDA's criterion for a "low sodium" package label claim (U.S. Department of Health and Human Services, 2013).

[22]The Institute of Medicine set the Tolerable Upper Intake Level (UL) at 2,300 mg per day, which is the highest daily nutrient intake level that is likely to pose no risk of adverse health effects to almost all individuals in the general population (DGA, 2010). In June 2016, the FDA issued draft sodium reduction targets for 150 food categories, including 2-year and 10-year goals for the industry that are intended to help Americans gradually reduce sodium intake from the current average of 3,400 mg per day to 3,000 mg per day and eventually to 2,300 mg per day.

A Note on Increases in Saturated Fats

An increase in saturated fat in 2008-12 is notable in several product categories, especially breakfast cereals and yogurt (approximately 15 percent) and frozen/refrigerated meals (6 percent).[23] Although this rise contributed to increases in total fat and calories from fat (fig. 13 and fig. 14), smaller changes occurred in average calories per serving (figs. 5, 7, and 10). This is because, in the breakfast cereal and yogurt categories, calories from fat accounted for less than 12 percent of total calories per serving on average in 2008-12. Hence, while calories from fat increased by 8 percent and 15 percent in the cereal and yogurt categories, respectively, changes in total calories were much smaller. In the frozen/refrigerated meals category, calories from fat contributed to a larger share of total calories on average (34 to 35 percent), but a smaller increase in saturated fat led to an increase in calories that was comparable to yogurt.

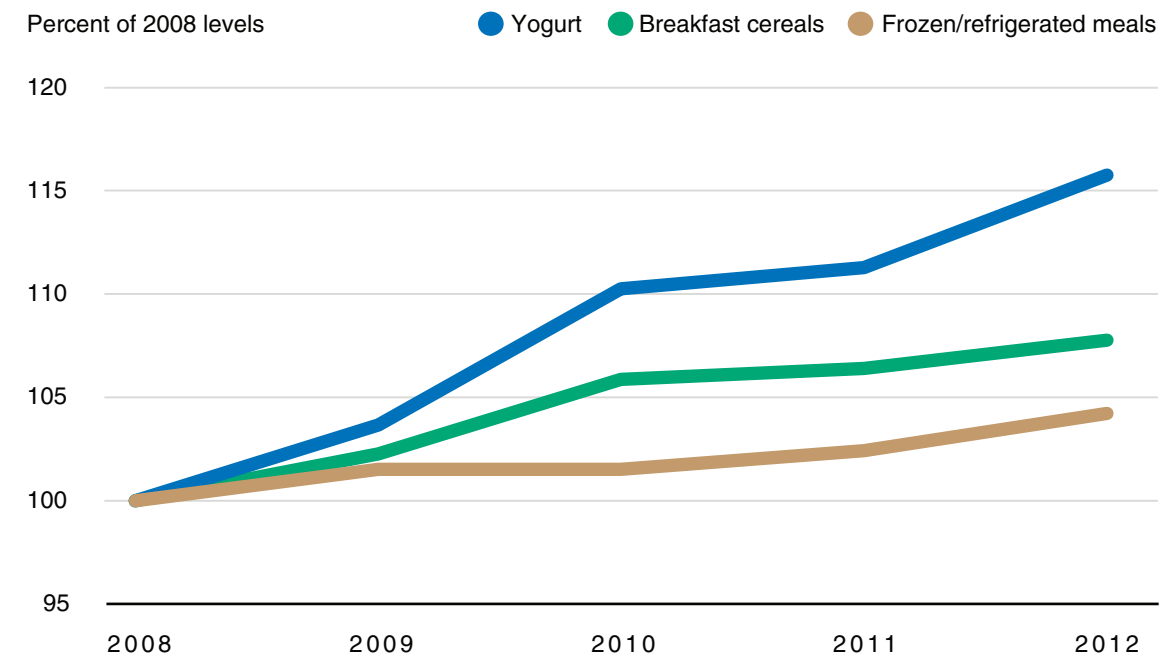
A portion of the gains in saturated fat in the yogurt category can be attributed to the introduction of yogurt drinks and yogurt made with whole milk. According to USDA's National Nutrient Database for Standard Reference Release 28, plain whole-milk yogurt contains 2.1 grams of saturated fat per 100-gram serving compared to 1 gram and 0.12 grams of saturated fat in yogurt made with low fat and skim milk, respectively. Newly introduced yogurt drinks in 2009-12 contained 2.08 grams of saturated fat per 225-gram serving compared to 1.57 grams per serving for non-drink yogurt products. The difference is statistically significant at the 1-percent significance level. For products exiting the market, there was little difference in the saturated fat content of yogurt drinks (1.18 grams per serving) and non-drinks (1.19 grams per serving). Hence, yogurt drink products entered the market with higher levels of saturated fat than entering non-drink yogurt products, unlike their exiting counterparts, for which saturated fat levels were roughly equal in yogurt drinks and non-drinks.

The average saturated fat content of entering whole-milk yogurt and yogurt drink products in 2009-12 is considerably greater than all other entering yogurt products (nearly twice as much saturated fat per serving), while this difference is much smaller for exiting yogurt products (13 percent more saturated fat for whole milk and yogurt drink products than all other yogurt products). Excluding drinks and whole-milk yogurt results in an 11-percentage-point increase in average saturated fat content per serving in 2008-12 (fig. 15). This compares to a 14-percentage-point increase when all yogurt products are included.[24]

[23]Studies have shown that youth (ages 8-12) who consume more prepackaged, processed meals have higher levels of saturated fat intake (Horning et al., 2017).

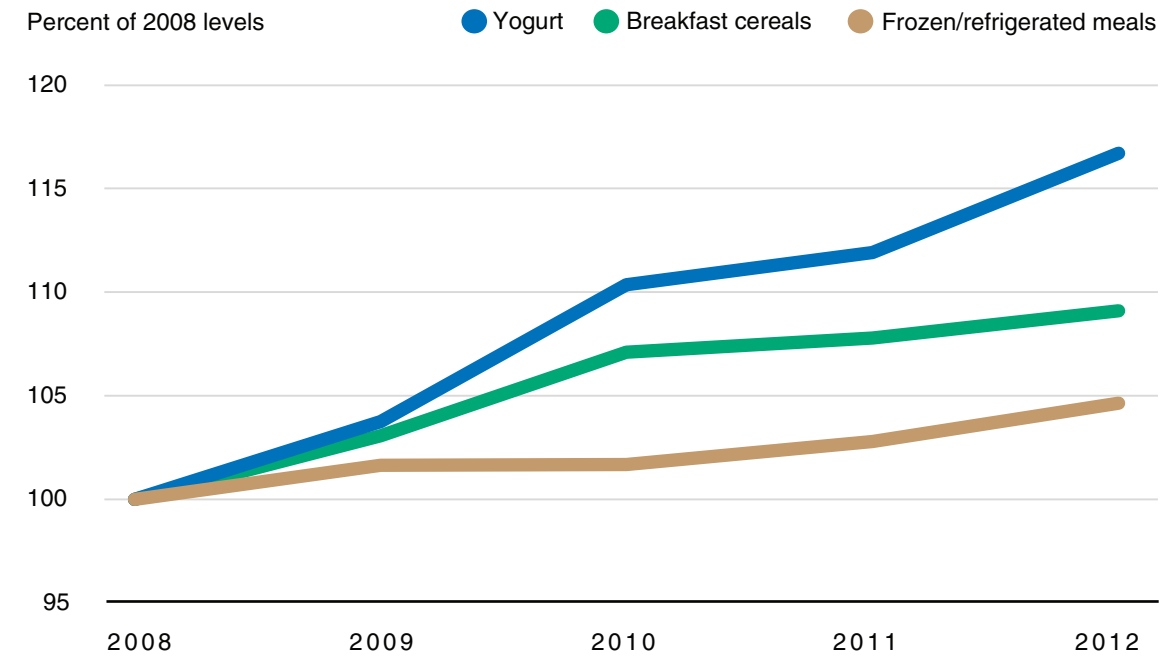
[24]The increase in average cholesterol content per serving also shrinks from 9 percentage points to 7 percentage points when yogurt drinks and whole-milk yogurt products are excluded.

Figure 13
Changes in total fat in select product categories, 2008-12



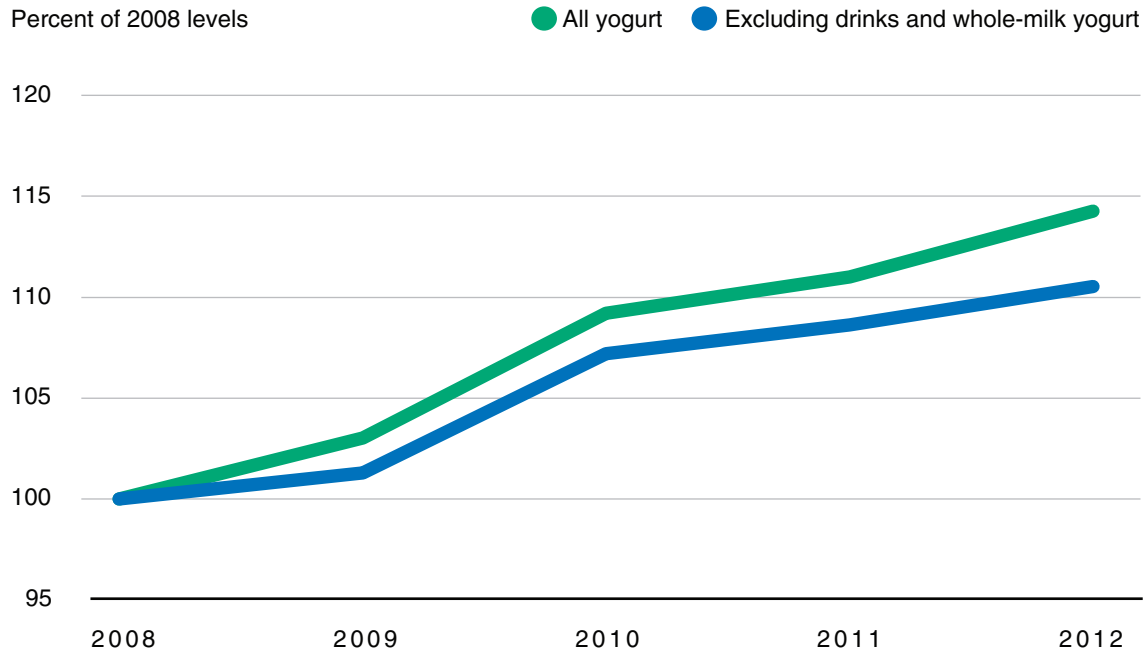
Source: IRI InfoScan data.

Figure 14
Changes in calories from fat in select product categories, 2008-12



Source: IRI InfoScan data.

Figure 15
Changes in saturated fat content of yogurt, 2008-12



Source: IRI InfoScan data.

Conclusions

Food and beverage products introduced into retail stores declined in 2009-12, while products exiting the market have increased. In 2012, the number of exiting products exceeded that of entering products, resulting in less variety of products sold. Product "innovations"—changes different enough to result in a new UPC code—varied by food category. Categories most active in new product introductions were candy, snacks, and beverages. Turnover rates (entry rates plus exit rates) were highest for candy products and nutrition/weight-loss products (e.g., powder shake mixes, nutrition bars, energy gels). Large differences in creation and destruction for categories such as snacks and candy suggest new products are gaining market share compared to established products.

According to the 2010 *Dietary Guidelines for Americans*, an immediate and deliberate reduction in the sodium content of foods in the marketplace is necessary to allow consumers to reduce sodium intake. Results suggest that manufacturers made some progress in reducing the sodium content in four of the five food categories we examine. These reductions were generally gradual, which is consistent with a strategy of "silent reductions" (IOM, 2010). Manufacturers gradually lowered sodium to allow consumers to slowly adjust their taste preferences without noticing the changes. Given changes in taste from less sodium and the cost of alternative reformulations, swifter reductions in sodium content may require Government regulatory actions or else increases in consumer preferences for lower sodium products.

Although sodium was gradually reduced in several product categories, saturated fats generally increased. These contradictory trends support the contention that policies focusing on reducing a single nutrient (such as sodium) may not lead to overall healthier products because companies may compensate for deterioration in taste by increasing levels of unhealthy nutrients (such as fat) (Moss, 2013).

Breakfast cereal manufacturers increased the fiber content of their products, but they have been criticized for selling products that are high in sugar as healthy options (Wen, 2015; Painter, 2016). Cereal products entered the market with a greater share of whole grain- and fiber-related label claims, such as "made with whole grains" and "good source of fiber," than labels of exiting products contained. However, without substantive reductions in sugar content and saturated fat, it is not clear whether products carrying these claims are healthier overall.

The size of nutritional changes varied by product category. For snack items, changes in nutritional content were small, with the exception of calcium, which declined by 9 percent in 2008-12. On the other hand, for breakfast cereal products, three of seven nutrients tracked changed by more than 5 percent, including a decline of 15 percentage points in calcium. The decline in calcium and calcium-related claims by cereal and snack manufacturers suggests waning interest in calcium content as a selling point. The *2015-2020 Dietary Guidelines for Americans* identifies calcium as an under-consumed nutrient by many individuals and ranks fortified cereals as a leading source of calcium. The declining status of calcium in manufacturers' reformulations is inconsistent with these guidelines.

Labeling regulations and dietary guidance regarding trans fats appear to have effectively reduced trans fats in food products. Although there was less progress in improving the nutritional content of frozen/refrigerated meal items than in other categories, sizeable reductions in trans fats were found in frozen/refrigerated meals. Some researchers have concluded that, as manufacturers reformulated

products to reduce trans fats, they corrected taste changes by increasing levels of saturated fat. However, evidence did not support this finding in the frozen/refrigerated meals category. Few products in the other four categories were identified as containing trans fats.

Our results also have implications for USDA nutrition data bases. The USDA National Nutrient Database for Standard Reference (SR) provides the basis for food composition tables that translate foods reported as consumed by individuals from dietary surveys, such as the National Health and Nutrition Examination Survey (NHANES), into measurements of nutrient intake and diet quality. The Food and Nutrition Database for Dietary Studies (FNDDS) uses the SR to determine composition of the average recipe for a variety of food and dishes reported in NHANES. Actual updating of each food item in the food composition data used for dietary surveys varies in frequency (Ng and Popkin, 2012; Slining et al., 2013). Only select categories are comprehensively reviewed for each version of FNDDS, and some food groups are updated only once every 6 years. In addition, there is a 2-year lag between the creation of FNDDS and its access (Ng and Popkin, 2012). This may be a key limitation for nutrients in some packaged and processed food categories as products enter and exit the market with differing nutrient levels. Periodic updates in the food composition data underscore the value of research that attempts to incorporate rapidly changing nutrient profiles into nutrient databases. These efforts ultimately result in improved estimates of dietary intakes.

Future research can use the methodology developed in this report to examine the economic determinants of product creation and destruction. For example, tight credit conditions may prompt retailers to increase sales and profits by eliminating certain products to reduce inventories (Brat et al., 2009). The effects of the Great Recession of 2007-09 may have led consumers to seek familiar products and avoid impulse buying (Weitzel, 2009; Orgel, 2009). In response to bargain-seeking customers who wanted to simplify their shopping trips as well as purchase familiar products, retailers may have reduced the number of products introduced (Martin, 2010; Brat et al., 2009). Lee and Schluter (2002) surmise that consolidation in food retailing may have led to more standardized products in stores and less opportunity for new food products.

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Appendix A: UPCs in InfoScan

InfoScan includes both national brands and private-label (store brand) products, and most private-label products are available at the UPC level. However, Target, Kroger, and Safeway share only their private-label data in an aggregated format. These three retailers share their private-label data at the brand-category level, for example "Target brand butter." All types of butter sold under the Target brand—salted/unsalted, regular/light, spreadable/non-spreadable, and the various sizes of each—are aggregated into the "Target brand butter" brand category. As a result, individual products within brand categories cannot be identified. Similarly, there is no nutrition/claim data for private-label data available at the brand-category level. Since our analysis relies on individual product information, we use only private-label data available at the UPC level.

While standard UPCs are 12 digits long, UPCs in InfoScan and IRI product dictionaries are 14 digits long. This is because IRI adds a two-digit "generation code" to the original 12-digit UPC in order to keep track of UPCs that are reused. For example, the first use of a specific 12-digit UPC will appear in the IRI product dictionary and InfoScan as the 12-digit UPC found on the product packaging with the "generation code" of 01 appended (i.e., the first use of the UPC), for a total of 14 digits. If this specific 12-digit UPC were to reappear in the IRI product dictionary, representing a new version of the product, the UPC would have a new generation code (02) appended, resulting in a new 14-digit UPC.

To match UPCs to other data sources, such as Gladson and Nielsen, IRI provided a variable that gives the true UPC that comes from the manufacturer, called the International Article Number (EAN), which we use in this analysis (Muth et al., 2016). The EAN includes 12 digits, along with a trailing check digit that is used to verify that the barcode is generated or scanned correctly. The first two digits identify the country/region numbering authority. The manufacturer code is a unique code assigned to each manufacturer, which can vary in length between manufacturers. The product code follows and is assigned by the manufacturer. The total length of the manufacturer plus product codes must be 10 digits.

Appendix B: Product Entries and Exits, As Well As Creation and Destruction, by Product Category

Appendix table 1
Percent of entries and exits that are "false"[1] in 2009-12

Category	Percent of all entries and exits	Percent of the value of all entries and exits
Candy	2.56	0.55
Snacks	2.56	1.02
Beverages	2.98	0.61
Condiments and sauces	2.91	0.65
Processed meat	2.95	0.97
Fruits and vegetables	3.34	0.56
Baking ingredients	3.06	0.42
Breakfast cereals	1.48	0.18
Desserts	2.02	0.26
Baby food	0.85	0.32
Nutrition/weight-loss foods	2.59	0.32
Meals and entrees		
Shelf-stable meals	2.57	0.42
Frozen/refrigerated meals	1.71	0.43
Dairy		
Yogurt	1.44	0.11
Other dairy	4.28	0.42
Bakery foods		
Bread products	2.39	0.42
Other bakery products	2.32	0.08

[1]"False" entries and exits are those products that reappear after exiting the sample. Products may have positive sales in one period, zero sales the following period, then positive sales again in the next period.
Source: IRI InfoScan data.

Appendix table 2

Product entry and exit rates by product category, 2009-12

Category		2008[1]	2009	2010	2011	2012
Candy						
New product introductions	Number		6,875	5,403	5,399	4,359
Product exits	Number		5,189	6,074	5,752	5,693
Total UPCs	Number	31,433	32,849	32,148	31,851	30,703
Product entry rates	Percent		20.9	16.8	17.0	14.2
Product exit rates	Percent		16.5	18.5	17.9	17.9
Snacks						
New product introductions	Number		6,366	5,007	5,473	4,114
Product exits	Number		3,912	4,538	4,525	5,017
Total UPCs	Number	31,507	33,700	34,063	35,169	34,405
Product entry rates	Percent		18.9	14.7	15.6	12.0
Product exit rates	Percent		12.4	13.5	13.3	14.3
Beverages						
New product introductions	Number		5,804	4,283	4,258	3,093
Product exits	Number		3,234	3,388	3,839	4,208
Total UPCs	Number	33,149	35,489	36,272	36,756	35,854
Product entry rates	Percent		16.4	11.8	11.6	8.6
Product exit rates	Percent		9.8	9.5	10.6	11.4
Condiments and sauces						
New product introductions	Number		3,645	3,225	2,873	2,402
Product exits	Number		3,097	3,228	3,176	3,316
Total UPCs	Number	37,306	37,623	37,536	37,376	36,640
Product entry rates	Percent		9.7	8.6	7.7	6.6
Product exit rates	Percent		8.3	8.6	8.5	8.9
Processed meat						
New product introductions	Number		3,944	2,773	2,979	2,328
Product exits	Number		2,390	2,782	2,767	2,908
Total UPCs	Number	21,761	23,191	23,152	23,356	22,961
Product entry rates	Percent		17.0	12.0	12.8	10.1
Product exit rates	Percent		11.0	12.0	12.0	12.5
Fruits and vegetables						
New product introductions	Number		2,719	2,490	2,343	2,135
Product exits	Number		2,245	2,246	1,846	2,100
Total UPCs	Number	25,933	26,198	26,412	26,994	27,182
Product entry rates	Percent		10.4	9.4	8.7	7.9
Product exit rates	Percent		8.7	8.6	7.0	7.8

Appendix table 2

Product entry and exit rates by product category, 2009-12 - *continued*

Category		2008[1]	2009	2010	2011	2012
Shelf-stable meals						
New product introductions	Number		3,580	2,599	2,685	2,039
Product exits	Number		2,154	2,175	2,291	2,601
Total UPCs	Number	27,088	28,394	28,699	29,202	28,741
Product entry rates	Percent		12.6	9.1	9.2	7.1
Product exit rates	Percent		8.0	7.7	8.0	8.9
Frozen and refrigerated meals						
New product introductions	Number		3,710	2,914	2,829	2,334
Product exits	Number		2,234	2,522	2,677	2,866
Total UPCs	Number	19,884	21,257	21,635	21,811	21,359
Product entry rates	Percent		17.5	13.5	13.0	10.9
Product exit rates	Percent		11.2	11.9	12.4	13.1
Bread						
New product introductions	Number		1,972	1,501	1,283	1,062
Product exits	Number		1,429	1,415	1,627	1,444
Total UPCs	Number	14,352	14,813	14,878	14,527	14,241
Product entry rates	Percent		13.3	10.1	8.8	7.5
Product exit rates	Percent		10.0	9.6	10.9	9.9
Other bakery products						
New product introductions	Number		3,273	3,328	2,016	1,377
Product exits	Number		1,971	2,604	3,034	2,330
Total UPCs	Number	15,725	16,923	17,608	16,625	15,771
Product entry rates	Percent		19.3	18.9	12.1	8.7
Product exit rates	Percent		12.5	15.4	17.2	14.0
Baking ingredients						
New product introductions	Number		3,382	2,676	2,623	2,136
Product exits	Number		2,227	2,397	2,575	2,747
Total UPCs	Number	32,171	33,101	33,312	33,482	33,016
Product entry rates	Percent		10.2	8.0	7.8	6.5
Product exit rates	Percent		6.9	7.2	7.7	8.2
Yogurt						
New product introductions	Number		718	516	709	529
Product exits	Number		596	473	646	458
Total UPCs	Number	3,716	3,829	3,696	3,933	4,016
Product entry rates	Percent		18.8	14.0	18.0	13.2
Product exit rates	Percent		16.0	12.4	17.5	11.6
Other dairy products						
New product introductions	Number		2,719	2,161	2,287	1,795
Product exits	Number		2,272	1,869	1,996	2,361
Total UPCs	Number	25,384	25,625	25,854	26,224	25,818
Product entry rates	Percent		10.6	8.4	8.7	7.0
Product exit rates	Percent		9.0	7.3	7.7	9.0

Appendix table 2

Product entry and exit rates by product category, 2009-12 - *continued*

Category		2008[1]	2009	2010	2011	2012
Breakfast cereals						
New product introductions	Number		1,208	790	718	703
Product exits	Number		747	940	770	739
Total UPCs	Number	5,389	5,829	5,670	5,634	5,616
Product entry rates	Percent		20.7	13.9	12.7	12.5
Product exit rates	Percent		13.9	16.1	13.6	13.1
Desserts						
New product introductions	Number		2,348	1,507	1,668	1,512
Product exits	Number		1,818	2,066	1,725	1,741
Total UPCs	Number	14,913	15,363	14,785	14,759	14,591
Product entry rates	Percent		15.3	10.2	11.3	10.4
Product exit rates	Percent		12.2	13.4	11.7	11.8
Baby food						
New product introductions	Number		435	255	275	333
Product exits	Number		199	219	169	235
Total UPCs	Number	1,699	1,926	1,960	2,073	2,170
Product entry rates	Percent		22.6	13.0	13.3	15.3
Product exit rates	Percent		11.7	11.4	8.6	11.3
Nutrition/weight-loss foods						
New product introductions	Number		363	335	599	349
Product exits	Number		342	323	352	305
Total UPCs	Number	2,078	2,067	2,079	2,339	2,397
Product entry rates	Percent		17.6	16.1	25.6	14.6
Product exit rates	Percent		16.5	15.6	16.9	13.0
All products						
New product introductions	Number		53,061	41,763	41,017	32,600
Product exits	Number		36,056	39,259	39,767	41,069
Total UPCs	Number	347,660	361,184	363,019	365,749	359,702
Product entry rates	Percent		14.7	11.5	11.2	9.1
Product exit rates	Percent		10.4	10.9	11.0	11.2

[1]Universal product codes (UPCs) in 2008 are used to derive exit rates in 2009.

Source: IRI InfoScan data.

Appendix table 3

Product creation and destruction by product category, 2009-12

Category		2008[1]	2009	2010	2011	2012
Candy						
Value of new products introduced	Million $		2,245.2	1,318.7	1,184.5	1,436.9
Value of product exits	Million $		100.7	154.6	126.4	130.8
Total value of UPCs	Million $	8,172.7	13,679.5	14,197.6	14,893.3	15,676.8
Creation	Percent		16.4	9.3	8.0	9.2
Destruction	Percent		1.2	1.1	0.9	0.9
Snacks						
Value of new products introduced	Million $		3,546.2	918.2	2,997.90	1,409.5
Value of product exits	Million $		31.7	67.4	51.4	58.3
Total value of UPCs	Million $	10,924.8	18,891.1	19,557.9	20,768.6	22,342.7
Creation	Percent		18.8	4.7	14.4	6.3
Destruction	Percent		0.3	0.4	0.3	0.3
Beverages						
Value of new products introduced	Million $		2,862.6	1,087.3	1,121.1	1,207.2
Value of product exits	Million $		14.0	36.3	27.1	24.0
Total value of UPCs	Million $	21,631.6	35,251.6	36,211.5	37,656.7	39,716.3
Creation	Percent		8.1	3.0	3.0	3.0
Destruction	Percent		0.1	0.1	0.1	0.1
Condiments and sauces						
Value of new products introduced	Million $		640.9	220.9	189.5	311.5
Value of product exits	Million $		10.1	16.2	14.8	18.7
Total value of UPCs	Million $	6,819.5	10,245.2	10,435.6	10,884.7	11,794.7
Creation	Percent		6.3	2.1	1.7	2.6
Destruction	Percent		0.1	0.2	0.1	0.2
Processed meat						
Value of new products introduced	Million $		3,388.40	829.2	1,159.30	929.6
Value of product exits	Million $		49.7	103.7	260.8	134
Total value of UPCs	Million $	11,101.1	20,352.2	20,382.6	20,161.3	22,703.3
Creation	Percent		16.6	4.1	5.7	4.1
Destruction	Percent		0.4	0.5	1.3	0.7
Fruits and vegetables						
Value of new products introduced	Million $		782.4	172.3	220.7	365.1
Value of product exits	Million $		25.4	49.2	23.3	17.9
Total value of UPCs	Million $	7,143.3	10,250.3	9,817.4	9,868.8	10,262.6
Creation	Percent		7.6	1.8	2.2	3.6
Destruction	Percent		0.4	0.5	0.2	0.2

Appendix table 3

Product creation and destruction by product category, 2009-12 - *continued*

Category		2008[1]	2009	2010	2011	2012
Shelf-stable meals						
Value of new products introduced	Million $		753.5	263.4	368.1	410.8
Value of product exits	Million $		7.5	17.3	6.0	16.4
Total value of UPCs	Million $	9,248.10	14,511.9	14,259.9	14,565.4	15,181.8
Creation	Percent		5.2	1.8	2.5	2.7
Destruction	Percent		0.1	0.1	0.0	0.1
Frozen and refrigerated meals						
Value of new products introduced	Million $		1,708.8	869.5	878.1	858.1
Value of product exits	Million $		36.1	70.5	31.3	56.5
Total value of UPCs	Million $	11,128.3	17,056.0	17,183.5	17,508.4	18,044.2
Creation	Percent		10.0	5.1	5.0	4.8
Destruction	Percent		0.3	0.4	0.2	0.3
Bread						
Value of new products introduced	Million $		448.4	330.6	287.1	198.1
Value of product exits	Million $		43.9	78.3	62.7	94.2
Total value of UPCs	Million $	6,890.4	9,708.1	9,815.7	9,953.2	10,180.1
Creation	Percent		4.6	3.4	2.9	1.9
Destruction	Percent		0.6	0.8	0.6	0.9
Other bakery products						
Value of new products introduced	Million $		444.8	323.5	313.9	302.6
Value of product exits	Million $		27.5	45.1	29.1	33.1
Total value of UPCs	Million $	2,828.1	4,234.5	4,212.9	4,348.6	4,645.7
Creation	Percent		10.5	7.7	7.2	6.5
Destruction	Percent		1.0	1.1	0.7	0.8
Baking ingredients						
Value of new products introduced	Million $		539.5	181.7	367.5	433
Value of product exits	Million $		9.2	9.7	9.7	9.6
Total value of UPCs	Million $	6,403.90	10,147.4	10,049.6	10,478.5	10,984.2
Creation	Percent		5.3	1.8	3.5	3.9
Destruction	Percent		0.1	0.1	0.1	0.1
Yogurt						
Value of new products introduced	Million $		461.9	327.2	343.8	251.9
Value of product exits	Million $		24.8	45.3	43.9	33.5
Total value of UPCs	Million $	2,545.9	3,720.9	4,043.3	4,170.1	4,876.5
Creation	Percent		12.4	8.1	8.2	5.2
Destruction	Percent		1	1.2	1.1	0.8

Appendix table 3

Product creation and destruction by product category, 2009-12 - *continued*

Category		2008[1]	2009	2010	2011	2012
Other dairy products						
Value of new products introduced	Million $		1,034.8	450.9	874.2	619.7
Value of product exits	Million $		110.5	73.8	70.5	203.5
Total value of UPCs	Million $	18,365.0	22,201.5	22,587.0	23,238.2	25,472.1
Creation	Percent		4.7	2.0	3.8	2.4
Destruction	Percent		0.6	0.3	0.3	0.9
Breakfast cereals						
Value of new products introduced	Million $		494.2	470.8	576.2	669.0
Value of product exits	Million $		19.1	19.7	10.1	15.7
Total value of UPCs	Million $	4,930.1	7,760.9	7,539.3	7,680.7	7,887.4
Creation	Percent		6.4	6.2	7.5	8.5
Destruction	Percent		0.4	0.3	0.1	0.2
Desserts						
Value of new products introduced	Million $		566.3	419.1	480.9	440.2
Value of product exits	Million $		13.0	24.5	11.1	18.2
Total value of UPCs	Million $	5,352.0	7,161.5	7,078.3	7,323.6	7,640.8
Creation	Percent		7.9	5.9	6.6	5.8
Destruction	Percent		0.2	0.3	0.2	0.2
Baby food						
Value of new products introduced	Million $		280.2	206.0	208.2	161.1
Value of product exits	Million $		3.6	1.0	1.0	1.6
Total value of UPCs	Million $	2,840.3	4,297.3	4,130.8	4,161.2	4,404.9
Creation	Percent		6.5	5.0	5.0	3.7
Destruction	Percent		0.1	0.0	0.0	0.0
Nutrition/weight-loss foods						
Value of new products introduced	Million $		31.7	24.0	33.9	40.0
Value of product exits	Million $		1.0	1.6	0.6	1.0
Total value of UPCs	Million $	413.2	448.9	464.5	539.7	619.9
Creation	Percent		7.1	5.2	6.3	6.4
Destruction	Percent		0.2	0.4	0.1	0.2

[1]Total value of universal product codes (UPCs) in 2008 are used to derive destruction rates in 2009.

Source: IRI InfoScan data.