



United States Department of Agriculture

Economic  
Research  
Service

Economic  
Research  
Report  
Number 207

May 2016

# WIC Household Food Purchases Using WIC Benefits or Paying Out of Pocket: A Case Study of Cold Cereal Purchases

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Diansheng Dong, Hayden Stewart, Elizabeth Frazão, Andrea Carlson, and Jeffrey Hyman. *WIC Household Food Purchases Using WIC Benefits or Paying Out of Pocket: A Case Study of Cold Cereal Purchases*, ERR-207, U.S. Department of Agriculture, Economic Research Service, May 2016.

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## **Abstract**

USDA's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is the Nation's third-largest food and nutrition assistance program. WIC participants receive Food Instruments they can exchange for foods like infant formula, milk, fruit juice, whole-grain bread, and cold cereal at authorized retail stores. Since participants incur no out-of-pocket costs when purchasing WIC foods, they may be less sensitive to prices when choosing among allowed food items. In this study, we analyze household purchases of cold cereals. Findings show that WIC households buy less costly cereals than non-WIC households, all else constant, when paying out of pocket. Not surprisingly, they purchase with relatively less regard to price when using their WIC benefits, which may increase the program's food costs. Findings also suggest that some restrictions imposed by WIC State agencies on brands and package sizes may help contain program costs. However, it may also be possible to develop incentives that encourage participants to purchase lower cost products without the negative impact that restrictions may have on participant satisfaction and program participation.

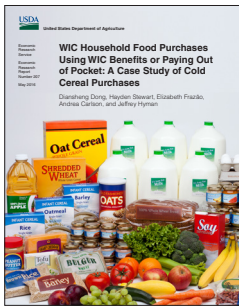
**Keywords:** WIC, cost containment, cold cereal, unit value, FoodAPS data

## **Acknowledgments**

The authors thank peer reviewers Collin Payne, New Mexico State University, and David Davis, South Dakota State University. We also thank peer reviewers Laura Tiehen with the U.S. Department of Agriculture/Economic Research Service and Alice Ann H. Gola of the U.S. Department of Agriculture/Food and Nutrition Service. Finally, we thank Mark Farrell and Courtney Knauth for editing and Cynthia A. Ray for design and layout, all of USDA/ERS.

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# WIC Household Food Purchases Using WIC Benefits or Paying Out of Pocket: A Case Study of Cold Cereal Purchases

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## What Is the Issue?

USDA's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is the Nation's third-largest food and nutrition assistance program. WIC participants typically receive Food Instruments that they can exchange for foods like infant formula, fluid milk, and cold cereal at authorized retail stores. These foods are carefully chosen to provide nutrients missing in the diets of the target population. Cold cereals provided through the WIC program must contain a specified minimum of iron, for instance, and not too much sugar. Regulations also stipulate that at least half of the cereals authorized on a State agency's food list be whole-grain.

The WIC program served about 8 million participants per month in fiscal year (FY) 2015 at a total cost of \$6.2 billion. Food costs, mostly incurred when State agencies reimburse authorized retailers for WIC participants' purchases, represent about 70 percent of WIC's overall budget. Since participants incur no out-of-pocket costs when purchasing WIC foods, economic theory suggests they may be less sensitive to prices when using their benefits, which may increase the program's total costs. To control costs, WIC State agencies may restrict the types of products that participants can buy and the types of stores they can patronize. In this study, ERS analyzes purchases of cold cereal by WIC and non-WIC households and between WIC households that pay for cereal out of pocket and those using their WIC benefits. A better understanding of the shopping habits and food choices of WIC households may help State agencies develop effective cost-containment strategies.

## What Did the Study Find?

USDA's National Household Food Acquisition and Purchase Survey (FoodAPS), conducted between April 2012 and mid-January 2013, offers unique insights into the food-shopping behavior of U.S. households. Among the 4,826 households who participated in the survey, 973 provided complete information on their purchases of 1,905 boxes of cold cereal. Of these households, 136 were participants in the WIC program. Analysis of the data confirms that WIC households are less price-sensitive when using benefits:

- When using WIC benefits, program participants spent \$0.24 per ounce for cold cereal, on average, significantly more than WIC households paying out of pocket (\$0.19 per ounce) and than non-WIC households (\$0.20 per ounce).

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

Although WIC-allowed cold cereals must satisfy specific nutritional requirements, this does not explain why participating households buy relatively more expensive products when using their benefits. Considering all the cold cereals allowed by at least 1 of the WIC State agencies in the 48 contiguous States and the District of Columbia, our analysis shows that WIC-allowed cereals were no more expensive than other cold cereals purchased by FoodAPS households:

- Cold cereals allowed by at least one WIC State agency cost about \$0.20 per ounce, roughly equal to the price paid for other brands of cold cereal. Indeed, after controlling for whether cereals were actually purchased using WIC benefits, among other factors, the study found that WIC-allowed cereals cost 1.5 cents less per ounce than other cereals.

To control costs, WIC State agencies may restrict participants' brand and package-size choices. Private-label cereals may cost less than national-brand cereals, and cereal packed in larger boxes may cost less per ounce than cereal in smaller containers. Simulations based on an economic model show that:

- Requiring WIC participants to purchase cold cereal in 18-ounce boxes might lower the cost of cereals purchased with WIC benefits by 1 cent per ounce (a 4.3-percent price decrease).
- Requiring WIC participants to choose a private-label product might lower the cost of cold cereals purchased with WIC benefits by 5 cents per ounce (a 22-percent price decrease).

WIC participants can generally use their benefits at both small and large stores, even though smaller stores tend to charge higher prices. However, simulations show that this may have little impact on average food costs, since most WIC households reflected in the data already purchase their cold cereal at a large store.

When considering restrictions on participants' choices of WIC foods, WIC State agencies balance the benefits of cost savings against the potentially negative impact of such restrictions on participants' access to food and satisfaction—and therefore consumption—of the food, as well as overall participation and satisfaction with the program. The need to strike this balance has led USDA to consider behavioral economic strategies, rather than actual restrictions, to nudge WIC participants to voluntarily choose less expensive items, package sizes, and/or stores. To this end, USDA has funded the Duke-University of North Carolina Center for Behavioral Economics and Healthy Food Choice Research (BECHR), which has devoted some of its resources to promoting behavioral economics research for improving food-cost efficiency within the WIC Program.

## **How Was the Study Conducted?**

Data from the National Household Food Acquisition and Purchase Survey (FoodAPS) were used in this study. Households participating in FoodAPS reported all the foods they acquired over a 7-day period between April 2012 and mid-January 2013. Detailed information such as price, brand, package size, and payment method was available on each item acquired. We first compared cold cereal purchases by WIC households when they paid out-of-pocket, WIC households when they paid with program benefits, and non-WIC households. For our main empirical analysis, we then estimated a model that predicted the average price paid per ounce for cold cereal by households while controlling for a large number of potentially confounding factors. Explanatory variables accounted for whether the purchasing household participated in WIC, whether the cereal was WIC-allowed, whether WIC benefits were used to pay for the cereal, whether the cereal was a private-label or national-brand product, and the package size. We also used retail scanner data to create a local price index, which we then used to control for geographic differences in retail food prices. Finally, using our model results, we performed simulations to measure the likely impact on food costs of requiring participants to patronize only large retail stores or of restricting their brand and package-size choices.

# WIC Household Food Purchases Using WIC Benefits or Paying Out of Pocket: A Case Study of Cold Cereal Purchases

## Introduction

USDA's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) served an average of 8.0 million participants per month in fiscal year (FY) 2015 (Food and Nutrition Service, 2016). Participants are pregnant, postpartum, or breastfeeding women; infants; and children up to age 5 who meet income guidelines and State residency requirements and are determined to be at nutritional risk by a health care professional. Participants commonly use Financial Instruments (FIs) issued by a WIC clinic to purchase foods from authorized retail stores, at no out-of-pocket cost to themselves.<sup>1</sup> The types of foods allowed are carefully chosen by Federal regulations to provide nutrients missing in the diets of the target population. With annual Federal expenditures of \$6.2 billion in FY 2015, WIC is the Nation's third-largest food and nutrition assistance program, trailing only USDA's Supplemental Nutrition Assistance Program (SNAP) and USDA's National School Lunch Program (NSLP) (Oliveira and Frazão, 2015).

Unlike SNAP and NSLP, WIC is not an entitlement program, as Congress does not set aside funds to allow every eligible individual to participate. WIC is instead a discretionary program for which the Federal Government provides grants to 90 State agencies, including the 50 States, the District of Columbia, 5 U.S. territories, and 34 Indian Tribal Organizations, which implement the program at the local level (Oliveira and Frazão, 2009). The number of people each State agency can serve depends on both the size of its grant and its operating costs (mainly food costs).<sup>2</sup> Food costs, mostly incurred when State agencies reimburse authorized retailers for their participants' purchases, are estimated to represent about 70 percent of WIC's overall budget (Oliveira and Frazão, 2015). These costs, in turn, depend on the prices of foods that participants choose to buy with their WIC benefits. Since participants incur no out-of-pocket costs when using WIC benefits, economic theory suggests that they may be less sensitive to prices when choosing WIC food items.

Vendors authorized to accept WIC benefits may include supermarkets, large and small grocery stores, mass merchandisers, convenience stores, gas stations, and food marts. Each of these retailers is free to set its prices according to its own supply-and-demand conditions. These conditions may include the size of the store, the location of the store, the types of nonfood items sold by the store, and the types of consumers who patronize the store. However, if a high percentage of certain types of foods are purchased using WIC benefits, retailers may be encouraged to charge higher prices for those foods. To ensure that WIC vendors charge competitive prices, WIC State agencies are required to establish vendor peer groups consisting of retailers with similar characteristics who should likewise be charging comparable prices.

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<sup>1</sup>Exceptions are Vermont, which uses home food delivery for most WIC foods, and Mississippi and parts of Illinois, which use direct distribution centers (Oliveira and Frazão, 2015).

<sup>2</sup>Evidence suggests that the program has been fully funded since the late 1990s (Oliveira and Frazão, 2015). However, a decrease in grants or an increase in food prices could reduce the program's ability to serve all eligible applicants.

Maximum-allowable reimbursement levels are then set for each vendor group for each FI. For example, in 2012, the State of California separated its authorized WIC vendors into 16 peer groups based on the number of cash registers, geographical region, and whether the retailer derived more than 50 percent of annual food sales from WIC redemptions (Saitone et al., 2014).

Another way that WIC State agencies manage food costs is by restricting participants' food choices according to various characteristics of the food product (e.g., Kirlin et al., 2003; Davis and Leibtag, 2005). Retail prices naturally vary by many characteristics, including brand, package size, flavor, and form (e.g., fresh, frozen, canned, fried, or ready-to-eat). For example, Virginia requires participants to buy the store/private-label brand of cold cereal when using their WIC benefits.<sup>3</sup> Most States also set minimum package-size restrictions for some foods. For example, when choosing a cold cereal in Florida, WIC participants must choose an 11-ounce or larger size container; in Arizona, the minimum package size is 14 ounces; and in Texas, it is 18 ounces. Seven States, including Delaware, impose no minimum package-size restriction for cold cereal.

A better understanding of the shopping habits and food choices of WIC households may help State agencies develop more effective strategies to contain program costs. In this study, we focus on households' purchases of cold cereal to investigate whether WIC households purchase more or less expensive products than non-WIC households when they pay out of pocket and whether WIC households continue to make the same choices when they use WIC benefits. We also measure the impact on food costs of allowing participants to patronize different types of retail stores, as well as the likely impact of restricting participants' brand and package-size choices.

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<sup>3</sup>According to the *WIC Food Package Policy Options Study—Final Report* (2011), a store brand carries the name of the store in which it is available; for example, Kroger's Crispy Rice, Piggly Wiggly Toasted Oats, or Food Lion Bran Flakes. Private labels may be sold in only one store (Great Value in Walmart; America's Choice in A&P) or in multiple stores (Shurfine and Western Family).



## A Case Study of Households' Cold Cereal Purchases

Children and women participating in WIC receive up to 36 ounces of cold cereal per month. We use this food product for our case study of WIC households' shopping habits and food choices for a number of reasons. First, cold cereal is the fourth-largest contributor to WIC food costs (after infant formula, fluid milk, and fruits and vegetables) (Vericker et al., 2013). However, unlike infant formula and milk, participants can choose from a wide variety of cold cereal products available in the market, different package sizes (that add to up to 36 ounces), and among different national and private-label brands. Further, it appears that participants have strong feelings about the choices of WIC-approved cereals. When Texas and Oklahoma WIC eliminated national-brand cereals from their food lists in the 1990s and restricted cereal purchases using WIC benefits to private-label brands, program participation fell, and both States introduced national-brand cereals back into their food lists (Kirchhoff, 1998).<sup>4</sup>

Federal regulations require that WIC cereals contain a minimum of 28 milligrams of iron per 100 grams of dry cereal, and not more than 21.2 grams of sucrose and other sugars per 100 grams of dry cereal (or 6 grams per ounce). Regulations also stipulate that at least half of the cereals authorized on a State agency's food list be whole-grain. To identify the types of cereals WIC State agencies tend to allow, we examined food lists published between fall 2014 and spring 2015 by 48 States and the District of Columbia (all food lists are available on the websites of these State agencies).<sup>5</sup>

When checking the approved food lists of different WIC State agencies, we identified 72 national-brand products that are allowed by at least 1 State agency, though not all of these products were approved in all of the States. Products commonly approved by WIC State agencies include plain Cheerios (45 of 49 agencies), plain Kix (43), Corn Flakes (41), Multi-Grain Cheerios (38), Quaker Life (38), Rice Chex (36), and Corn Chex (36). A complete list of all national-brand cold cereals that we identified as WIC-allowed is provided in the appendix (table A-1).

When checking the approved food lists of WIC State agencies, we also noticed that most allow both national- and private-label brands of cereals. Exceptions include Virginia and Missouri, which allow only private-label products, and Texas, which allows only national brands. If a State agency chooses to allow national brands, it tends to allow about 15 to 25 different national-brand products, though the exact number varies. Hawaii, Utah, and Washington State allow 10 or less, while Pennsylvania and the District of Columbia allow 40. Appendix table A-2 lists the total number of national-brand cold cereals authorized for purchase by each WIC State agency.

On the one hand, State agencies try to offer products that meet their participants' preferences. Many State agencies survey their participants to determine their cereal preferences; they may also ask local agency staff to report any comments made by WIC participants about cereals they would like the program to offer. On the other hand, State agencies need to weigh the benefits of increased variety against the costs. There are administrative costs for checking the nutrient content of different cereals to ensure that they conform to regulations. Offering too many cereals also increases the size of the food list (many of which include pictures of the national-brand cereal boxes) and could even make it harder for participants, as well as store cashiers, to keep track of which cereals are allowed and which are not allowed.

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<sup>4</sup>We have no evidence of WIC participants having a similar reaction in Virginia, which currently allows purchases of private-label brands only.

<sup>5</sup>This study does not include Vermont (which uses home food-delivery contractors for all foods except fruits and vegetables) or Mississippi (which uses direct distribution centers).

# The National Household Food Acquisition and Purchase Survey

USDA's National Household Food Acquisition and Purchase Survey (FoodAPS) offers unique insights into the food choices of American households, including WIC participants. For FoodAPS, 4,826 households living in various locations throughout the continental United States recorded all the foods they acquired over 7 consecutive days between April 2012 and mid-January 2013. Each household's primary respondent participated in two in-person interviews and up to three telephone interviews. Collected data include information on food items purchased or otherwise acquired, including location, price, brand, package size, flavor, and payment method (e.g., WIC benefits or out-of-pocket funds). See box "FoodAPS Data" for additional details on FoodAPS.

Among the 4,826 households who took part in FoodAPS, 463 participated in WIC.<sup>6</sup> Although the survey is nationally representative of the U.S. population, including SNAP households, we do not know the extent to which FoodAPS is also representative of all WIC households nationwide. WIC administrative data provide the characteristics of WIC participants, not of WIC households, and we therefore lack an appropriate benchmark against which to compare our FoodAPS households.

Below, we investigate cold cereal purchases by FoodAPS participants, including WIC and non-WIC households. All major variables used in the study are defined in table 1. Mean values and standard deviations for each of these variables are provided in table 2. Mean values and standard deviations for WIC households when they pay out-of-pocket, WIC households when they pay with program benefits, and non-WIC households are compared in table 3.

## *Cold Cereal Purchases by FoodAPS Households*

Among the 4,826 households participating in FoodAPS, 973 provided complete information on their purchases of 1,905 boxes of cold cereal (table 2).<sup>7</sup> WIC households account for approximately 14 percent (136) of these households; mean household size is 3.3 members, and close to one-quarter of these households have children ages 1 to 4. The heads of these households are 44 years old, on average; nearly 20 percent are Hispanic; 48 percent are employed at least part time; and 23 percent have a college degree.

Of the 1,905 boxes of cold cereal purchased by FoodAPS households, the average price paid was 20 cents per ounce (table 2), though there was considerable variation from the least to most expensive. Twenty-five percent of cereals purchased cost less than 15 cents per ounce, and 25 percent cost more than 24 cents per ounce. The amount a particular household pays for cereal is likely to depend on many factors, including the brand and package size. National-brand products manufactured by companies like General Mills and Kellogg's naturally vary in price. A household can make more and less expensive choices when buying these types of products. However, private-label products are often less expensive. The average price of private-label cold cereals purchased by FoodAPS households is \$0.15 per ounce, while the average price for national-brand cereals is \$0.21 per ounce.

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<sup>6</sup>Most of these households self-reported participating in WIC. Survey administrators explicitly asked survey participants whether anyone in their household received benefits through the program. A small number of households did not acknowledge participating in the program but still reported using WIC benefits for a transaction during the survey week. These households are counted as WIC households for the purposes of this study.

<sup>7</sup>Purchases for which FoodAPS households did not provide complete information were excluded from our analysis. In most of these cases, the household did not provide the barcode needed to identify the exact brand and package size.

## FOODAPS Data

The FoodAPS survey was funded by USDA's Economic Research Service and Food and Nutrition Service. The survey was designed and conducted by Mathematica Policy Research, Inc. (MPR). FoodAPS is nationally representative of noninstitutionalized households in the continental United States and also representative of four subgroups across the United States: SNAP participants, nonparticipating households below the Federal poverty line (FPL) for household size, households between 1.0 and 1.85 of the FPL, and households with income greater than 1.85 of the FPL. The sample of households was selected through a multistage sample design, with coverage in the contiguous United States and oversampling of SNAP-participating and other low-income households. A stratified sample of 50 Primary Sampling Units (PSUs), defined as counties or groups of contiguous counties, was selected using probability proportional to size (PPS) selection. Within each of the 50 sampled PSUs, 8 secondary sampling units (SSUs), comprising a Census Block Group or a group of contiguous block groups, were selected. Sampled addresses within these SSUs were then screened to determine if the household was eligible to participate. A total of 4,826 households, containing 14,317 individuals, participated. Data were collected from April 2012 to January 2013.

In the screening process, the main food shopper or meal planner was identified as the primary respondent (PR). The PR was asked to complete two in-person interviews and to call the study's telephone center for three brief telephone interviews regarding food acquisition events over the course of 1 week. Each household member age 11 and older was asked to track and report all food acquisitions during the 1-week period in specially prepared booklets. The PR and other adult food booklets included pages to report details for both food-at-home (FAH) (blue pages) and food-away-from-home (FAFH) (red pages) acquisitions, while the youth booklets for children ages 11 to 17 included only red pages to report FAFH acquisitions. The PR was responsible for recording food acquisitions by members under age 11. When filling out their food booklets, participants were asked to distinguish between "food and drinks brought into the home" and "meals, snacks, and drinks you got outside the home," with the former being recorded on blue pages within the primary food book and the latter being recorded on red pages within each member's food book. These pages asked for details such as location, date, and payment types. Households were also asked to scan barcodes on packaged foods and save their receipts from stores and restaurants. For FAH items that could not be scanned, such as variable-weight items purchased by the unit or pound (e.g., a head of lettuce or individual apples), the respondents could scan barcodes from a specially designed Food Barcode Book. When the food was not listed in this barcode book, respondents were asked to write item details on the blue event pages. For FAFH, respondents were asked to save their receipts and write down any details they could on the red pages in their food books and then report details about each event in the three phone calls during the survey week.

Considerable post-processing was done to compile and resolve inconsistencies in the event- and item-level information provided through the scanner and phone calls and on survey books and receipts. Item-level expenditure and quantity information was collected directly from the receipt. When the receipt was unreadable or not provided, item expenditure was imputed when sufficient information about the item was available. For foods obtained free, the market value was also imputed when possible.

Nutrient values were also obtained for FAH and FAFH foods by matching to the USDA Food and Nutrient Database for Dietary Studies or the USDA National Nutrient Database for Standard Reference. Supplementary information about the local food environment was also compiled. This component—known as the Geography Component— includes various measures of food access and food prices in and surrounding the PSUs and SSUs.

Source: Ver Ploeg et al. (2015).

Table 1

**Variables used in the analysis**

Name	Definition
<b>Household variables</b>	
WIC HOUSEHOLD	=1 if the household reported participating in WIC; =0 otherwise
FAMILY SIZE	the number of people in the household
PREGNANT	=1 if the household has at least one pregnant woman
CHILDREN1-4	=1 if the household has children from 1 to 5 years old
CHILDREN5-18	=1 if the household has children from 5 to 18 years old
AGE	age of the head of household
HISPANIC	=1 if the head of household is Hispanic
BLACK	=1 if the head of household is African American
EMPLOYED	=1 if the head of household is employed
COLLEGE	=1 if the head of household has completed college
<b>Purchase variables</b>	
PRICE	Final price paid for cereal by the household (\$/oz), after discounts
WICcereal	=1 if the product is allowed by at least one WIC State agency
WICpaid	=1 if the purchase was paid for using WIC benefits
NBrand	number of national brand products allowed by WIC State agency
PI	average price of cold cereal (\$/oz) in county where household resides
PACKAGE SIZE	package size of the product (oz)
PRIVATE LABEL	=1 if the product is private label
COUPONS	value of any redeemed coupons per ounce (\$/oz)
STORE SAVING	savings per ounce related to store promotions and other specials (\$/oz)
COMBINED GROCERY	=1 if purchased in a combination grocery/other and gas station/market
CONVENIENCE STORE	=1 if purchased in a convenience store
DOLLAR STORE	=1 if purchased in a dollar store
SMALL GROCERY	=1 if purchased in a small or medium grocery store
CLUB STORE	=1 if purchased in a club store
OTHER STORES	=1 if purchased in another store type
LARGE STORE	=1 if purchased in a large store (super stores, supermarkets, and large grocery stores)

WIC= Special Supplemental Nutrition Program for Women, Infants, and Children.

Source: Calculated by USDA, Economic Research Service, using National Household Food Acquisition and Purchase Survey (FoodAPS) data.

Table 2

**Mean and standard deviations of variables for all households that purchased cereal**

Household variables	Total households: 973	
	<i>Mean</i>	<i>Std. dev.</i>
WIC HOUSEHOLD	0.1398	0.3469
FAMILY SIZE	3.3217	1.8393
PREGNANT	0.0298	0.1701
CHILDREN1-4	0.2446	0.4301
CHILDREN5-18	0.5242	0.4997
AGE	44.0247	15.3122
HISPANIC	0.1963	0.3974
BLACK	0.1028	0.3038
EMPLOYED	0.4758	0.4997
COLLEGE	0.2312	0.4218
Purchase variables	Total boxes of cereal: 1905	
	<i>mean</i>	<i>std. dev.</i>
PRICE	0.2023	0.0876
WICcereal	0.2856	0.4518
WICpaid	0.0598	0.2373
NBrand	23.5475	8.7095
PI	0.1982	0.0389
PACKAGE SIZE	17.1192	8.891
PRIVATE LABEL	0.1386	0.3456
COUPONS	0.0017	0.0137
STORE SAVING	0.0215	0.0595
LARGE STORE	0.8909	0.3266
COMBINED GROCERY	0.0262	0.1599
CONVENIENCE STORE	0.0136	0.1161
DOLLAR STORE	0.0336	0.1802
SMALL GROCERY	0.0084	0.0913
CLUB STORE	0.0226	0.1486
OTHER STORES	0.0047	0.0686

WIC= Special Supplemental Nutrition Program for Women, Infants, and Children.  
Source: Calculated by USDA, Economic Research Service, using National Household Food Acquisition and Purchase Survey (FoodAPS) data.

Table 3

**Mean and standard deviations of variables for WIC and non-WIC households that bought cold cereal**

Household variables	Non-WIC households: 837		WIC households: 136					
			Total (136)		Did not use benefits (74)		Used benefits <sup>1</sup> (62)	
	<i>mean</i>	<i>std. dev.</i>	<i>mean</i>	<i>std. dev.</i>	<i>mean</i>	<i>std. dev.</i>	<i>mean</i>	<i>std. dev.</i>
WIC HOUSEHOLD	0	0	1	0	1	0	1	0
FAMILY SIZE	3.1051	1.6967	4.6544	2.1095	4.6757	1.9025	4.629	2.3486
PREGNANT	0.0143	0.1189	0.125	0.3319	*	*	*	*
CHILDREN1-4	0.1601	0.3669	0.7647	0.8108	0.3943	0.4055	0.7097	0.4576
CHILDREN5-18	0.5042	0.5003	0.6471	0.6757	0.4713	0.4055	0.6129	0.4911
AGE	45.3644	15.3547	35.779	12.186	35.689	12.205	35.887	12.262
HISPANIC	0.1852	0.3887	0.2647	0.4428	0.3108	0.466	0.2097	0.4104
BLACK	0.1016	0.3022	0.1103	0.3144	*	*	*	*
EMPLOYED	0.4898	0.5002	0.3897	0.4895	0.4189	0.4967	0.3548	0.4824
COLLEGE	0.2485	0.4324	0.125	0.3319	*	*	*	*
Purchase variables:	Total purchases by non-WIC HH:1,573		Total purchases by WIC HHs:322		Not paid by WIC:218		Paid by WIC:114	
	<i>mean</i>	<i>std. dev.</i>	<i>mean</i>	<i>std. dev.</i>	<i>mean</i>	<i>std. dev.</i>	<i>mean</i>	<i>std. dev.</i>
PRICE	0.1979	0.0709	0.2106	0.0825	0.1941	0.0816	0.2423	0.075
WICcereal	0.2529	0.3911	0.4849	0.5005	0.2156	0.4122	1	0
WICpaid	0	0	0.3434	0.4756	0	0	1	0
NBrand	22.883	8.9107	24.910	8.3741	25.1239	8.0287	24.5	9.0204
PI	0.1986	0.037	0.1993	0.0437	0.1963	0.0105	0.2049	0.0731
PACKAGE SIZE	17.9369	9.2195	16.1957	7.2345	16.4159	8.626	15.7746	3.1854
PRIVATE LABEL	0.1518	0.3369	0.1506	0.3582	0.2156	0.4122	*	*
COUPONS	0.0016	0.0095	0.0008	0.0072	0.0013	0.0088	0	0
STORE SAVING	0.0175	0.0443	0.0122	0.0471	0.0162	0.0561	0.0045	0.019
LARGE STORE	0.8793	0.3361	0.9308	0.2608	0.922	0.2769	0.9473	0.226
COMBINED GROCERY	0.0216	0.1435	*	*	*	*	*	*
CONVENIENCE STORE	0.0158	0.1215	*	*	*	*	*	*
DOLLAR STORE	0.0371	0.1833	*	*	*	*	*	*
SMALL GROCERY	0.0048	0.069	*	*	*	*	*	*
CLUB STORE	0.0342	0.1793	*	*	*	*	*	*
OTHER STORES	0.0072	0.0844	*	*	*	*	*	*

\*Statistics are omitted due to small cell sizes and disclosure concerns.

<sup>1</sup>Includes 19 households that also paid with cash. WIC= Special Supplemental Nutrition Program for Women, Infants, and Children.

Source: Calculated by USDA, Economic Research Service, using National Household Food Acquisition and Purchase Survey (FoodAPS) data.

About 14 percent of the cold cereals bought by FoodAPS households were private-label brands. Average package size was 17 ounces. Savings due to coupon usage averaged 0.2 cents per ounce, and savings due to store promotions, loyalty discounts, and other specials reduced the final price by 2 cents per ounce.

FoodAPS households also reported purchasing cereal at a variety of retail outlets. However, 89 percent of the 1,905 boxes of cold cereal were bought at a large store (defined to include large grocery stores, super stores, and supermarkets). Dollar stores were the second-most frequent venue, accounting for 3 percent of all purchases.

### *Comparing Cereal Purchases by WIC and non-WIC Households*

We next compared cold cereal purchases between non-WIC and WIC households, both when WIC households pay for the cereal out of pocket and when they use their WIC benefits (table 3). As expected, the 136 WIC households that bought cereal were more likely to contain small children (ages 1 to 4) or a pregnant female than non-WIC households who also bought cereal (table 3).<sup>8</sup> Moreover, among these WIC households, 62 used their benefits to acquire cereal during the survey week. These households included 19 WIC families who reported paying for some cereal out of pocket and using their program benefits to acquire at least 1 other box. The 62 WIC households who used program benefits to buy cereal were more likely to include small children than the 74 WIC households who only bought cereal with their own resources during the survey week.<sup>9</sup>

Many WIC and non-WIC households reported buying more than one box of cereal (fig. 1). Most (80 percent of non-WIC households and 71 percent of WIC households) bought 1 or 2 boxes during the survey week. About 17 percent of WIC households bought 4 or more boxes, while 9 percent of non-WIC households bought that many.

In total, non-WIC households purchased 1,573 boxes of cold cereal at an average unit price of about \$0.20 per ounce, while WIC households used their own resources to purchase 218 boxes at an average unit price of \$0.19 per ounce. Notably, this difference is not statistically significant, though we have yet to control for other factors that influence prices paid by households for cold cereal.<sup>10</sup> By contrast, WIC households used their benefits to acquire 114 boxes of cold cereal at a higher average price of \$0.24 per ounce. This difference is statistically significant.<sup>11</sup> From this initial comparison, it does appear that WIC households are less price sensitive when using their WIC benefits.

Some of the variation in prices paid for cold cereal appears to reflect differences in households' willingness to purchase private-label products. Private-label products account for 15 percent of all boxes of cold cereal bought by non-WIC households who participated in FoodAPS and 22 percent of all boxes of cold cereal bought by WIC households using their own resources. By contrast, private-label cereals account for few of the cereals paid for with WIC benefits.<sup>12</sup>

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<sup>8</sup>Difference is statistically significant at the 5-percent level.

<sup>9</sup>Same as footnote 8.

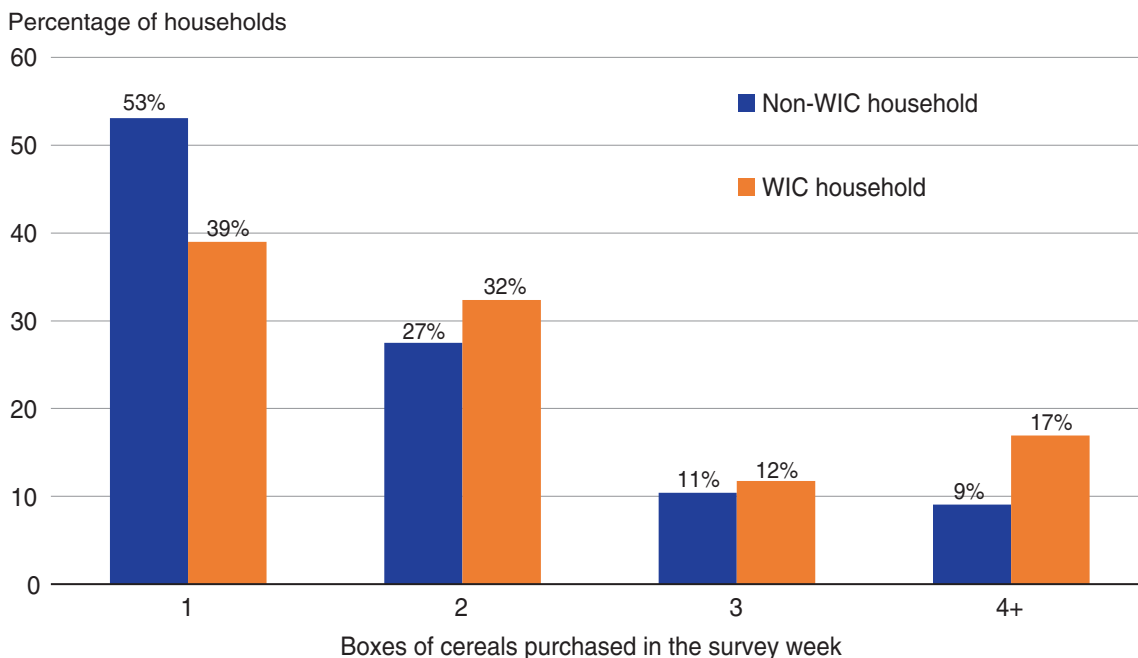
<sup>10</sup>This difference is not statistically significant at the 5-percent level. When estimating our statistical model, we will control for other determinants of the prices households pay for cold cereal.

<sup>11</sup>This is statistically greater than what both non-WIC households and WIC households paying out of pocket spent at the 5-percent level.

<sup>12</sup>As indicated in the footnote of table 3, we do not report the exact number due to small size and disclosure concerns.

Figure 1

**Most FoodAPS households who bought cold cereal purchased one or two boxes**



WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Source: Calculated by USDA, Economic Research Service, using National Household Food Acquisition and Purchase Survey (FoodAPS) data.

Cereal-purchasing FoodAPS households also bought cold cereals in a range of package sizes. Among non-WIC households, the most frequently bought size range is 12 to 14 ounces (fig. 2). This is also the most popular package size among WIC households that pay out of pocket. By contrast, when using program benefits, WIC households buy 16- to 18-ounce packages about half the time. This choice may reflect minimum-size restrictions in place in some States. Moreover, since participants can use WIC benefits to purchase up to 36 ounces of cold cereal, purchasing 2 boxes with 18 ounces of cereal in each container is one way to obtain the maximum benefit.

Coupons and store promotions may also help households save money on cereal purchases (table 3). Among cereals bought by non-WIC households, savings averaged 0.2 cents per ounce due to coupon usage and 2 cents per ounce due to store promotions. Among cereals purchased out of pocket by WIC households, savings due to coupon usage was about 0.1 cents per ounce and savings due to store promotions was 1.6 cents per ounce. However, among cereals paid for with WIC benefits, both types of savings were much smaller (0 cents due to coupon usage and 0.5 cents due to store promotions, respectively).<sup>13</sup>

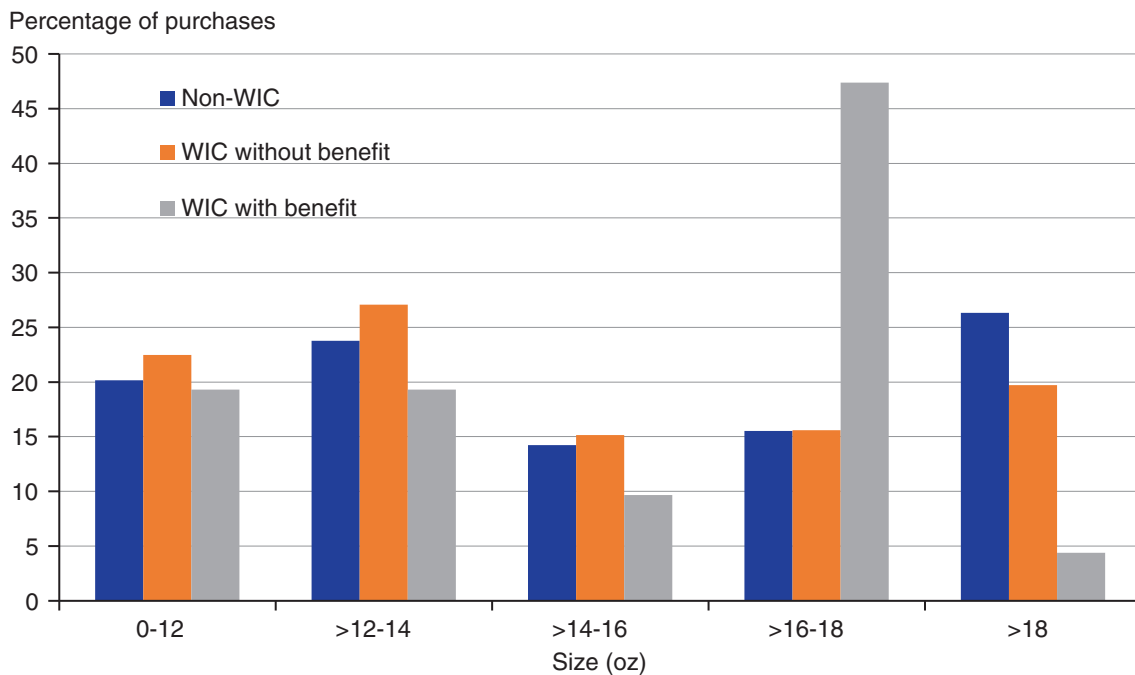
Of course, WIC benefits can only be used to purchase selected cereals. As noted earlier, these cereals are nutritionally different than other cereals on the market. WIC-allowed cereals must contain at least

<sup>13</sup>FoodAPS data indicate whether a survey participant received a promotional discount on a particular transaction and, if so, how much money was saved. However, it is unclear why one household might have reported saving money through a promotion while another did not. For example, it could be hypothesized that in-store promotions focus on products that are less often purchased by WIC households, both when they pay with their own money and when they use benefits. However, testing this hypothesis would require additional information on which products were being promoted by stores and is beyond the scope of this study.



Figure 2

**WIC and non-WIC households buy cold cereal in a variety of package sizes**



WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Source: Calculated by USDA, Economic Research Service, using National Household Food Acquisition and Purchase Survey (FoodAPS) data.

28 milligrams of iron per 100 grams of dry cereal and not more than 21.2 grams of sucrose and other sugars per 100 grams of dry cereal. If the cereals that satisfy these nutrient requirements are typically more or less expensive than other cereals, this could also contribute to differences in prices paid by non-WIC households and WIC households, as well as differences in prices paid by WIC households using program benefits and those paying out of pocket. To account for this possibility, we identified all cold cereals that were authorized for purchase by at least one WIC State agency in 2014-15 (see appendix table A-1), though not all of the identified cereals were approved in all States. Among the 1,905 boxes of cold cereal purchased by FoodAPS households, 544 (29 percent) are WIC-allowed by at least 1 State agency. The unit price paid per ounce for these WIC-allowed cereals as defined in this study (\$0.200) is similar to that for non-WIC cereals (\$0.203).<sup>14</sup>

Overall, we find differences in unit prices paid per ounce for cold cereal between WIC and non-WIC households, and differences when WIC households pay for the cereal out of pocket versus when they use their WIC benefits. We also find differences in households' brand and package-size choices as well as differences in savings due to coupon usage and store promotions, which likely explain some of the observed differences in unit prices. Below, we estimate a statistical/econometric model to measure the effects on cold cereal purchases of each of these factors.

<sup>14</sup>This difference is not statistically significant at the 5-percent level.

## A Model of Households' Cold Cereal Purchases

As mentioned earlier, it appears that WIC participants do not choose to purchase the same cold cereals as non-WIC households and that they are less price-sensitive when using their WIC benefits than when they are paying out of pocket. However, restrictions placed by State agencies on households' brand and package-size choices may influence these differences. Also influential may be the demographic characteristics of a household, such as the age of any children present in the home, among other things. To investigate, we estimate a price equation that predicts the average price paid per ounce for cold cereal by households, while controlling for a large number of potentially confounding factors.

Suppose household  $i$  chooses cold cereal product  $j$  in the survey week. The price paid for this product can be defined as:

$$(1) P_{ij} = X_i\alpha + Z_{ij}\beta + PI_i\theta_1 + WICereal_j * \theta_2 + WICpaid_{ij} * \theta_3 + WICpaid_{ij} * NBrand_i * \theta_4 + u_i + e_{ij}$$

where  $X_i$  is a vector of household variables such as whether the household participates in WIC, whether the household has small children, the number of people in the household, and others listed in table 1. These variables are proxies for a household's food preferences. None of the variables in  $X_i$  can be modified or influenced by food vendors for the purpose of increasing profits, nor by State agencies for the purpose of food cost containment.

Also included in our model is a vector of variables,  $Z_{ij}$ , that describe the transaction in which household  $i$  bought product  $j$ . These variables include whether the product is a private-label or national brand, the package size, whether any coupons were redeemed, and store type where the product was purchased (see table 1). These variables are largely influenced by food manufacturers or retail vendors. State agencies may also influence the variables by placing restrictions on WIC households' choices over the variables. For example, State agencies may allow participants to choose only private-label products or products in a 12-ounce package size or larger.

An additional variable accounts for whether a cereal is WIC-allowed. As discussed earlier, WIC cereals have unique nutrient characteristics. This suggests that these cereals may also be priced differently than other products on the market. To account for the possibility that cereals possessing the nutrient characteristics required by the WIC program are priced differently than other cereals, we create the binary variable,  $WICereal_j$ , to indicate whether product  $j$  is allowed by any of the WIC State agencies.

A separate variable accounts for whether a cereal was actually purchased with WIC benefits. The binary variable,  $WICpaid_{ij}$ , indicates whether household  $i$  paid for product  $j$  with WIC benefits. This variable captures the expected difference in price paid for a cereal product, which would reflect differences in cereal choice based on whether the cereal was purchased with WIC benefits or out-of-pocket funds.<sup>15</sup>

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<sup>15</sup>The price paid for cereal using WIC benefits may vary with both the WIC household's choice among foods on a State agency's approved food list and the way the State regulates that list. In this study, we make an effort to separate these two effects, though this remains an interesting topic for future research.

We also account for the number of national-brand cereals allowed by the WIC State agency where household  $i$  resides,  $NBrand_i$ . State agencies commonly allow their participants to choose from among 15 to 25 different national-brand cereals, though the exact number varies. To investigate whether this variation affects the price paid for products bought with WIC benefits, we include in our model the interaction between  $NBrand_i$  and  $WICpaid_{ij}$ . An interaction term is used because the number of national-brand products allowed by each State affects the purchase only when participants make the purchase using WIC benefits.

Finally, we account for geographic variations in overall retail food prices by defining a price index variable,  $PI_i$  that measures the average unit price of cold cereal in a household's community of residence.<sup>16</sup> A selection of retail establishments provides IRI, a market research company, with weekly sales data (revenue and quantity). These retail establishments include grocery stores, supermarkets, super centers, convenience stores, and drug stores, among others. For our study of cold cereal purchases, we use 2012-2013 IRI's retail scanner data to estimate the average cost per ounce for all cold cereals across all participating stores in a household's county of residence.

Aside from the explanatory variables defined earlier, we also include a random term,  $u_i$ , to capture unobservable household heterogeneity. Our data include 1,905 observations—1 for each box of cold cereal purchased by a FoodAPS household. As discussed earlier, some of these purchases were made by the same household. Sixty-one percent of WIC households bought more than 1 box of cereal, and 47 percent of non-WIC households bought more than 1 box (see fig. 1). When households made multiple purchases, we would expect prices paid for products bought by the same household to be more similar to each other than prices paid for boxes of cereal bought by different households. This is because each household has its own unique food preferences. However, we do not have variables to account for all the idiosyncrasies of a household that impact its particular choices. We instead include  $u_i$  in our model to capture those unobserved parts of household heterogeneity.<sup>17</sup>

To complete the econometric model, we further add a stochastic error term,  $e_{ij}$ , and denote the unknown parameters to be estimated as  $\alpha$ ,  $\beta$ ,  $\theta_1$ ,  $\theta_2$ ,  $\theta_3$ , and  $\theta_4$ . The estimation of equation (1) is facilitated by assuming that  $u_i$  and  $e_{ij}$  are both independently and identically normal distributed as below:

$$(2) \quad u_i \sim N(0, \sigma_u^2), \quad e_{ij} \sim N(0, \sigma_e^2)$$

The log likelihood function of (1) then can be written as:

$$(3) \quad \log L = \sum_{i=1}^n \left( -\frac{1}{2} n \ln(2\pi) - \frac{1}{2} \ln |\Sigma_i| - \frac{1}{2} \boldsymbol{\varepsilon}_i' \Sigma_i^{-1} \boldsymbol{\varepsilon}_i \right)$$

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<sup>16</sup>That is, households are likely to pay higher prices for cereal if they live in locations that have overall higher prices.

<sup>17</sup>This is similar to an unbalanced panel data model with random effects. Our data are cross-sectional and include 1 week's cereal purchases. We do not observe purchases over time. However, some households may have made multiple purchases during the 1-week survey period.

Where:

$$(4) \ \varepsilon_i = \begin{bmatrix} P_{i1} - (X_i\alpha + Z_{i1}\beta + PI_i\theta_1 + WICereal_1 * \theta_1 + WICpaid_{i1} * \theta_2 + WICpaid_{i1} * NBrand_i * \theta_3) \\ P_{i2} - (X_i\alpha + Z_{i2}\beta + PI_i\theta_1 + WICereal_2 * \theta_1 + WICpaid_{i2} * \theta_2 + WICpaid_{i2} * NBrand_i * \theta_3) \\ \vdots \\ P_{iJ_i} - (X_i\alpha + Z_{iJ_i}\beta + PI_i\theta_1 + WICereal_{J_i} * \theta_1 + WICpaid_{iJ_i} * \theta_2 + WICpaid_{iJ_i} * NBrand_i * \theta_3) \end{bmatrix}_{J_i \times 1}$$

and:

$$(5) \ \Sigma_i = \begin{bmatrix} \sigma_u^2 + \sigma_u^2 & \sigma_u^2 & \dots & \sigma_u^2 \\ \sigma_u^2 & \sigma_u^2 + \sigma_u^2 & \dots & \sigma_u^2 \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_u^2 & \sigma_u^2 & \dots & \sigma_u^2 + \sigma_u^2 \end{bmatrix}_{J_i \times J_i},$$

where  $J_i$  is the number of cereal boxes purchased by household  $i$  in the survey week. Since each household may buy a different number of cereal boxes in the week,  $J_i$  varies across households.  $n$  is the total number of households in the sample. The parameter estimates can be obtained using the maximum likelihood estimation (MLE) procedure based on equations (3) to (5). See Greene (2000) for additional details.

## What Drives Variation in Prices Paid for Cold Cereal?

In order to gauge the impact of individual factors on cereal prices, we present the effect of each independent variable in table 4. Many of these effects are significant at the 5-percent level. Our key findings follow.

WIC households do not appear to be as price-sensitive when using their WIC benefits. WIC households typically spend 1.1 cents, or 5.5 percent, less per ounce for cold cereal than other households when they use their own money. However, as economic theory predicts, they spend 3.7 cents, or 19 percent, more per ounce when using their WIC benefits than they would when using their own resources, and 2.6 cents (3.7 cents minus 1.1 cents), or 13 percent, more per ounce than what a non-WIC household would pay for such a cereal.<sup>18</sup>

The higher unit price paid by WIC households when buying cereal with their WIC benefits does not reflect the fact that these benefits can only be used to purchase cereals with at least 28 milligrams of iron and not more than 21.2 grams of sugar per 100 grams of dry cereal, or that half of all cereals on a State agency's approved food list must be whole grain. To the contrary, the model shows that, holding other variables constant, cereals meeting the WIC Program's nutrient requirements cost 1.5 cents less per ounce than other cereals in the market.

The model confirms that some of the types of restrictions placed by State agencies on participants' brand choices and package sizes are likely to hold down prices paid by WIC participants when they are making purchases using their WIC benefits. Private-label products tend to cost 6 cents less per ounce than national brands. Cold cereal packed in larger sized boxes also tends to cost less per ounce than cereal packed in smaller containers. By contrast, restrictions on the number of national-brand products allowed, if any, have no significant effect on cereal prices. In other words, if a State agency chooses to allow any national brands, cereal prices are unaffected by whether the agency authorizes 10 or 30 of these products.<sup>19</sup>

Our findings also confirm that cold cereals are typically less expensive if bought from large grocery stores, super stores, or supermarkets.<sup>20</sup> The only exception is dollar stores. Cold cereals bought at one of those stores tend to cost about 3 cents less per ounce than cold cereals purchased at large stores, all else constant. Small grocery stores are the priciest, charging 16 cents more per ounce of cereal than a large store.

Other factors impacting prices paid for cold cereal include coupon usage, store promotions, and the overall cost of cold cereal in a household's community of residence. *COUPON* and *STORE SAVINGS* are associated with spending less money per ounce for cold cereal, while larger values of *PI* (our price index) are associated with paying more.

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<sup>18</sup>It is calculated as the difference between the marginal effects of *WICpaid* (0.0372) and *WIC HOUSEHOLD* (-0.0108). Its standard error is 0.0186.

<sup>19</sup>The reported results apply only within the range of the variables in our data. As shown in appendix table A-2, no State agency examined for this study allows more than 40 national-brand cereals. Thus, we cannot say what would happen if a State agency were to allow, say, 50 or 60 national brands.

<sup>20</sup>Interestingly, controlling for package size, club stores charge about 13 cents more per ounce than other large stores. This suggests that the discounted prices charged by club stores for cold cereal reflect the larger packages they offer.

Table 4

**Model estimates**

Variables	Estimates	St. err	t-ratio
CONSTANT	<b>0.2979</b>	<b>0.0122</b>	<b>24.4594</b>
WIC HOUSEHOLD	<b>-0.0108</b>	<b>0.0043</b>	<b>-2.5096</b>
FAMILY SIZE	<b>-0.0031</b>	<b>0.0009</b>	<b>-3.4724</b>
PREGNANT	-0.0068	0.0109	-0.6261
CHILDREN1-4	<b>0.0185</b>	<b>0.0035</b>	<b>5.2306</b>
CHILDREN5-18	<b>0.0081</b>	<b>0.0038</b>	<b>2.1236</b>
AGE	0.0000	0.0001	-0.29
HISPANIC	<b>-0.0073</b>	<b>0.003</b>	<b>-2.4544</b>
BLACK	-0.0001	0.0042	-0.012
EMPLOYED	0.0013	0.003	0.4482
COLLEGE	<b>0.0099</b>	<b>0.003</b>	<b>3.3016</b>
PI	<b>0.0769</b>	<b>0.0389</b>	<b>1.9738</b>
PRIVATE LABEL	<b>-0.0612</b>	<b>0.0059</b>	<b>-10.323</b>
PACKAGE SIZE	<b>-0.0057</b>	<b>0.0002</b>	<b>-34.7568</b>
COUPONS	<b>-0.2848</b>	<b>0.0451</b>	<b>-6.3152</b>
STORE SAVING	<b>-0.2001</b>	<b>0.0132</b>	<b>-15.1285</b>
COMBINED GROCERY	<b>0.0448</b>	<b>0.0052</b>	<b>8.591</b>
CONVENIENCE STORE	<b>0.0482</b>	<b>0.0102</b>	<b>4.704</b>
DOLLAR STORE	<b>-0.0312</b>	<b>0.0121</b>	<b>-2.5886</b>
SMALL GROCERY	<b>0.1576</b>	<b>0.0044</b>	<b>35.5523</b>
CLUB STORE	<b>0.1319</b>	<b>0.0186</b>	<b>7.0831</b>
OTHER STORES	-0.0052	0.0142	-0.3664
WICereal	<b>-0.0147</b>	<b>0.004</b>	<b>-3.697</b>
WICpaid	<b>0.0372</b>	<b>0.0181</b>	<b>2.0524</b>
WICpaid*NBrand	0.0002	0.0006	0.2593
$\sigma_e$ (standard deviation of error term $e$ )	<b>0.0472</b>	<b>0.0004</b>	<b>109.568</b>
$\sigma_u$ (standard deviation of random effect term $u$ )	<b>0.0445</b>	<b>0.001</b>	<b>46.3072</b>

\*Bold numbers are significant at the 5-percent level and above.

WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Source: Calculated by USDA, Economic Research Service, using National Household Food Acquisition and Purchase Survey (FoodAPS) data.

## How Much Could WIC Save by Restricting Participants' Cold Cereal Choices?

Using data from FoodAPS, we have investigated cold cereal purchases by non-WIC households and WIC households when they use their own financial resources and benefits. In this section, we use our estimation results to simulate the price paid per ounce for cold cereal by WIC participants when they use their benefits to make the purchase. We also simulate how this price would change under several scenarios, such as restricting all WIC households to specific package sizes, or private-label brands, or specific types of stores. Due to some limitations of our FoodAPS data, including the possibility that WIC households who participated in the survey may not be representative of all WIC households nationwide, some of our simulation results should be interpreted with caution. Nonetheless, these results may help State agencies to balance any potential cost savings with participant satisfaction and participation in the program. Even a small change of 1 or 2 cents per ounce of cereal could substantially impact WIC's food costs because children and women that participate in the program may receive 36 ounces of cereal per month. For example, a 1-cent per ounce savings could save up to 36 cents per participant per month;<sup>21</sup> with an average of 6,083,999 children and women participating in WIC per month in FY 2015, the 1-cent per ounce savings per month could add up to \$26 million per year, or 0.6 percent of the \$4.2 billion spent on food in FY 2015.

We begin our simulations by using our estimated model to predict the price paid for cold cereal by a representative WIC household, given a set of values for our independent variables. For an initial (base) scenario, we set the household characteristic variables in  $X_p$ , such as household size and whether the household has small children, equal to the mean of these variables over all the WIC households in our sample. These values are given in table 3. We similarly set the variables in  $Z_{ij}$  that describe the transaction in which household  $i$  acquired cereal  $j$ , such as package size and store type, equal to the means over all the WIC households in the sample, and set the average price of cold cereal in the household's county of residence to its mean value. Finally, we set  $WIC_{cereal} = 1$  and  $WIC_{paid} = 1$ , in order to predict the price paid for cold cereal when our representative household uses its benefits. The simulated price paid for cold cereal in this base scenario is \$0.23 per ounce. Next, we predict anew the price paid for cold cereal by our representative household under three alternative scenarios and compare those results to our base price (figs. 3 through 6).

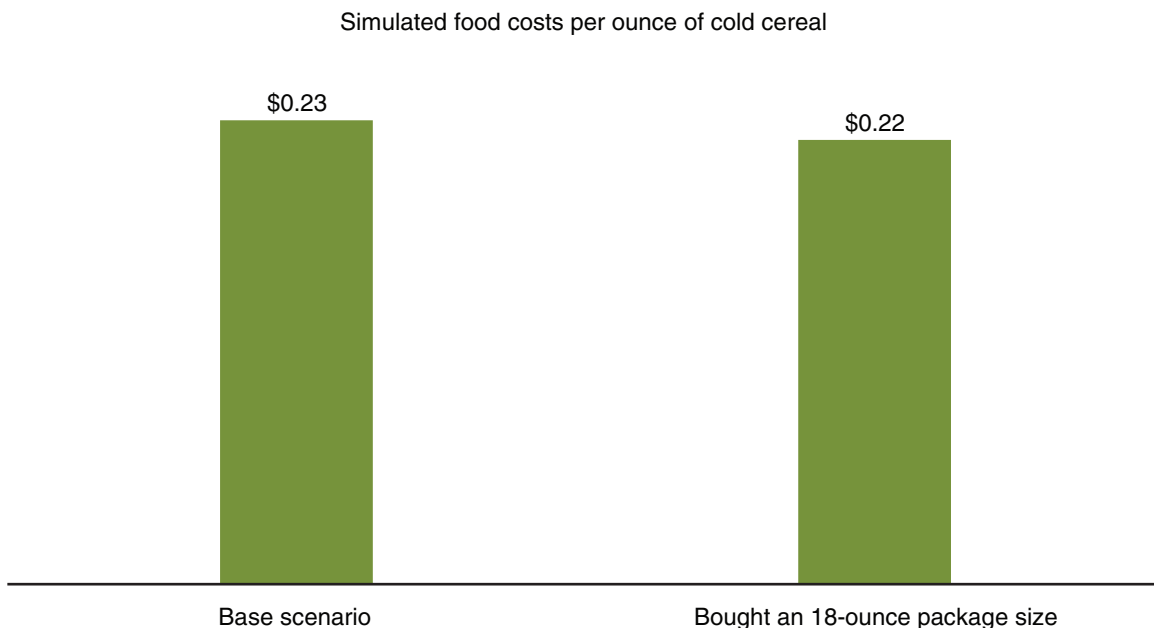
For our first set of simulations, we examine the impact on cereal unit price if WIC State agencies increased their minimum package-size requirements. To begin, we considered that certain package sizes better allow WIC households to acquire the 36 ounces prescribed to them. For example, purchases of one 36-ounce package, two 18-ounce packages, or three 12-ounce packages would each provide the full 36 ounces. By contrast, if a household buys 12.2-ounce packages, it can only acquire two of them with its WIC benefits and would only get 24.4 ounces out of the 36 ounces allowed. For this reason, we first simulated the price per ounce of cold cereal if WIC households buy cold cereal in 18-ounce boxes (fig. 3). This is accomplished by setting the value of *PACKAGE SIZE* to 18 and setting all other variables in the model at the mean value, as in the base scenario. We find that cereal unit price decreases by 1 cent per ounce after this increase in package size. Considering that WIC State agencies may consider increasing their minimum size requirement, but maybe not as high as

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<sup>21</sup>This assumes that all cereal purchased by WIC participants is cold cereal. However, many State agencies allow participants to instead purchase hot cereal, which is not included in this study.

Figure 3

### Restricting package size to 18 ounces would lower food costs 1 cent per ounce



Source: USDA, Economic Research Service, simulations based on estimation results shown in table 4.

18 ounces, we further simulate cereal price per ounce for a wide range of values (fig. 4). The figure clearly shows that the per unit price decreases almost linearly as average package size increases.

The second set of scenarios illustrates the impact on the unit price paid for cold cereal if WIC households were required to choose a private-label product when using their benefits (fig. 5). We began by setting *PRIVATE LABEL* equal to 1. The other variables in our model remain unchanged from the base scenario. The simulated price is \$0.18 per ounce, which is 5 cents per ounce less than our base price of \$0.23 per ounce. Private-label products are typically less expensive than national-brand products, and the large difference between our alternative and base scenarios reflects the fact that few WIC households in our data used their benefits to purchase private-label cereals. To further predict food costs when all WIC households use their WIC benefits to purchase national-brand products, we set *PRIVATE LABEL* equal to 0. We now find that the simulated price is \$0.24 per ounce, which is close to our baseline estimate.

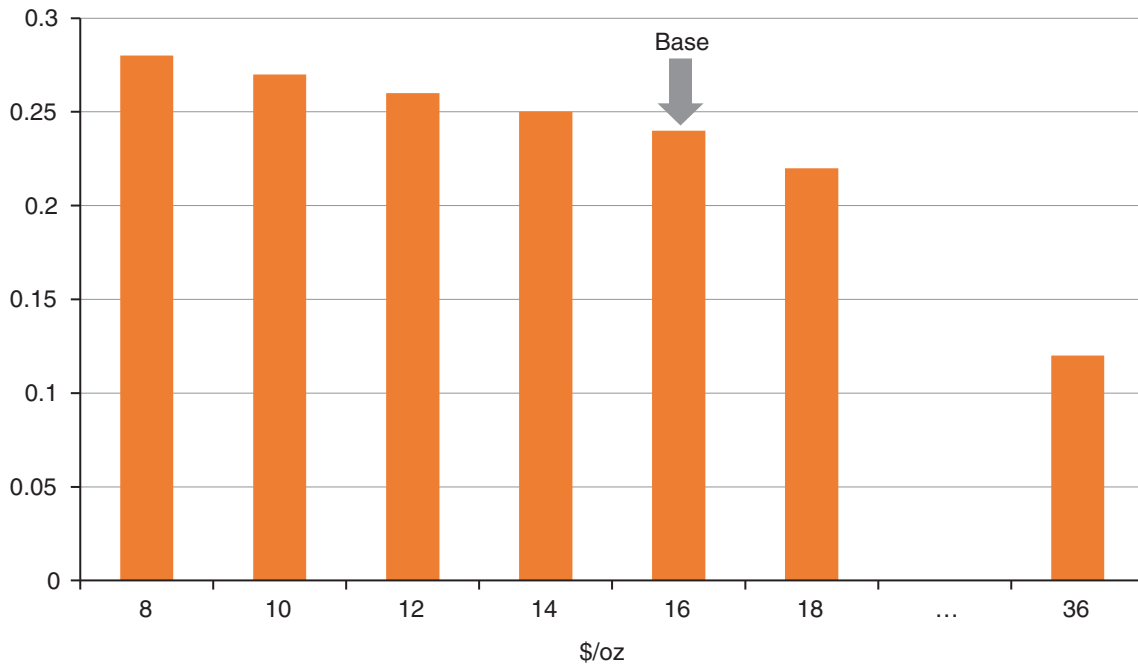
Our last scenario simulates the impact on unit price if WIC participants were unable to use their benefits at small grocery stores (fig. 6). We set *SMALL GROCERY* equal to 0 and adjusted upwards the values of *COMBINED GROCERY*, *CONVENIENCE STORE*, and the other variables for store type on the assumption that households that are prevented from using their benefits at a small grocery store would use their benefits at one of these other types of stores instead.<sup>22</sup> All other variables are held unchanged from the base scenario. The simulated price, \$0.23 per ounce, is no different than the price in the base scenario, since very few WIC households use their benefits at a small grocery store; rather, most of these households already patronize large stores.

<sup>22</sup>We inflated each of the store-type variables by the same factor so that *LARGE STORE* (omitted), *COMBINED GROCERY*, *CONVENIENCE STORE*, *DOLLAR STORE*, *CLUB STORE*, and *OTHER STORE* would sum to one.



Figure 4

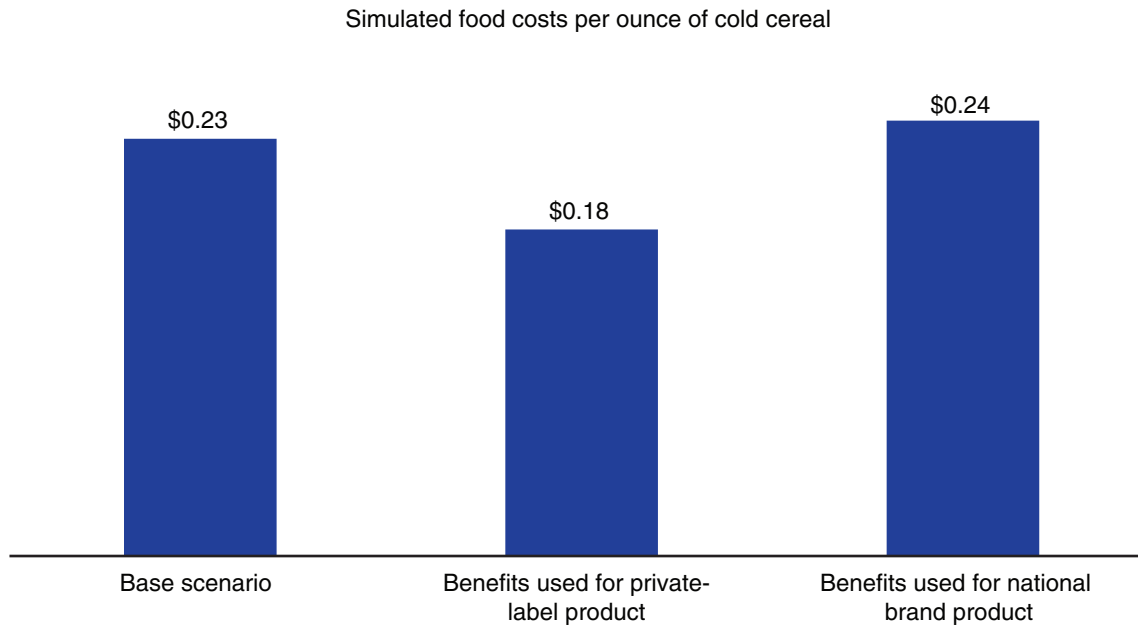
**Simulated prices of different-package-sized cereals purchased with WIC benefits**



WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.  
Source: USDA, Economic Research Service, simulations based on estimation results shown in table 4.

Figure 5

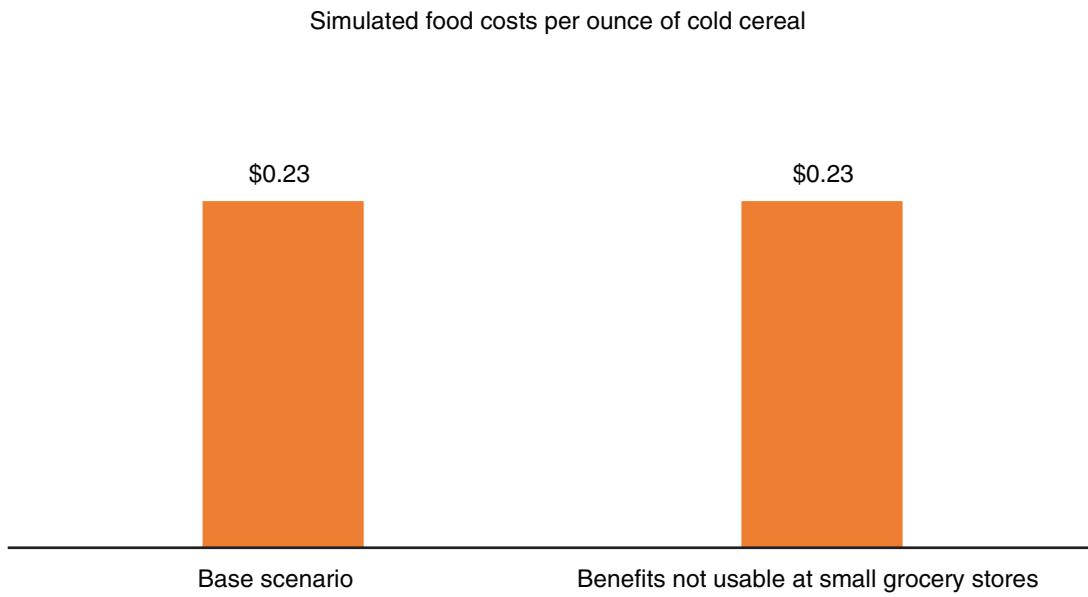
**Choosing a private-label product lowers food costs**



Source: USDA, Economic Research Service, simulations based on estimation results shown in table 4.

Figure 6

**Small grocery stores are pricey, but allowing WIC participants to shop at them has little impact on average food costs**



Source: USDA, Economic Research Service, simulations based on estimation results shown in table 4.

## Conclusions

WIC households buy cereals with a lower price per ounce than other households, all else constant, when paying out of pocket. However, consistent with economic theory, they seem to purchase with relatively less regard to price when using their WIC benefits. They buy different products on these occasions. This, in turn, could be adding to the WIC program's overall costs.

As expected, we find that large food stores typically charge lower prices than other store types. Nonetheless, allowing participants to use their benefits at a wide range of store types may have little impact on WIC's overall food costs. Most WIC households that participated in FoodAPS already redeem their cereal benefits at large grocery stores, supermarkets, and super stores. Small grocery stores are the priciest, but few participants redeem their cereal benefits there. These findings are similar to Davis and Leibtag (2005); Kirlin et al. (February 2003 and May 2003); and, most recently, Saitone et al. (2014). In their analysis of California's vendor peer group program, Saitone et al. (2014) also found that small vendors charged higher prices on average than large vendors. They simulated the likely impact on overall food costs of (1) inducing small vendors to charge prices comparable to large vendors, and (2) eliminating the vendors in each peer group who appear to charge the highest prices. They found that both strategies would produce only modest cost savings, as most WIC households in California already shop at larger, less expensive stores when redeeming their WIC benefits.

Restricting the types of products that participants can buy with their benefits is one way that WIC State agencies control food costs. In this study, we confirm that some package-size and brand restrictions imposed by State agencies are likely holding down costs. However, among States that allow national brands, we also find that the number of national-brand cereals actually allowed, whether as few as 10 or as many as 30, does not affect the average unit price paid by a program participant when purchasing the cereal with WIC benefits.

When considering restrictions on the variety of products that program participants can purchase with their benefits, or the types of stores they can patronize, WIC State agencies balance the benefits of any cost savings against the potentially negative impact that such restrictions may have on clients, as well as overall satisfaction and participation in the program. The need to strike this balance has led USDA to consider behavioral economic strategies, rather than actual restrictions, to nudge WIC participants into voluntarily choosing less expensive items, package sizes, and/or stores (Oliveira and Frazão, 2015). To this end, USDA has funded the Duke-UNC Center for Behavioral Economics and Healthy Food Choice Research (BECHR), which has devoted some of its resources to promoting behavioral economics research to improve food-cost efficiency within the WIC Program.

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## Appendix: Evolution of WIC Food Packages Since 2010: Cold Cereal

Following a review of WIC food packages in 2005 by the Institute of Medicine of the National Academies of Science, USDA's Food and Nutrition Service (FNS) published interim regulations in 2007 significantly revising the type and quantities of foods it provides to WIC participants. WIC State agencies were required to implement the revised food packages by October 1, 2009. Under the new regulations, at least half of the cereals on a State agency's approved food list must be whole grain. State agencies can offer certain corn- and rice-based cereals to participants who may have allergies to whole grain cereals. However, FNS encourages State agencies to issue whole-grain cereals to participants to the maximum extent possible.

Though changes have not been made to the cereal component of WIC food packages since 2009, State agencies have continued to adjust the specific cereal items that WIC participants may purchase with their benefits. For this study, we examined approved food lists published by 48 States (excluding Vermont and Mississippi) and the District of Columbia, which are available online. All food lists were collected between fall 2014 and spring 2015. We then compiled a list of national-brand cold cereals that are approved by at least 1 of the 49 State agencies, though not all of the identified cereals are approved in all States. Finally, we compared our results with similar information collected by FNS in 2010. That information was published in a 2011 report, *WIC Food Package Policy Options Study—Final Report*. A side-by-side comparison for the two periods of allowed cold cereals is shown in appendix table A-1.

In 2014-15, WIC State agencies continued to allow many of the same cereals that already appeared on their approved food lists in 2010. National-brand cold cereals widely allowed by WIC State agencies continue to include Cheerios (45 States in both time periods), Kix (43 States in 2014-15 versus 39 in 2010), Corn Flakes (41 versus 43), Multi Grain Cheerios (38 in both time periods), Quaker Life (38 versus 39), Rice Chex (36 versus 38), and Corn Chex (36 versus 32).

State agencies added 20 national-brand cold cereals to their food lists between 2010 and 2014-15. Products newly allowed by 1 or more of the 49 State agencies examined for this study include Berry Berry Kix (12 States), Go Diego Go! (3 States), Scooby-Doo (9 States), and Alpha Bits (6 States).

Overall, compared with 2010, State agencies are allowing a larger number of national-brand cereals. As shown in appendix table A-2, only 8 States allowed fewer national brands in 2014-15. Moreover, there is a 91-percent correlation between the number of cold cereals that a State allowed in 2010 and in 2014-15. Thus, the States that allowed a relatively larger number of national brands in 2010 still offered a relatively larger number of national brands in 2014-15.

In 2014-15, only two States, Virginia and Missouri, required WIC participants to choose private-label brands. Utah allowed some national-brand products manufactured by MOM (formerly Malt-O-Meal). However, if a store does not carry a private-label brand, then participants can also choose the least expensive national brand.

**National-brand breakfast cold cereals authorized by State WIC agencies in 2010 and from fall 2014 to spring 2015**

Fall 2014 to spring 2015		2010	
Cereal product (manufacturer/product name) (72 in total)	Number of States	Cereal product (manufacturer/product name) (52 in total)	Number of States
<b>General Mills</b>		<b>General Mills</b>	
<i>Cheerios-Regular</i>	45	<i>Cheerios-Regular</i>	45
<i>Kix-Plain/Regular/Original</i>	43	<i>Chex-Rice</i>	39
<i>Cheerios-Multi-Grain</i>	38	<i>Cheerios-Multi-Grain</i>	38
<i>Chex-Rice</i>	36	<i>Kix-Plain/Regular/Original</i>	38
<i>Chex-Corn</i>	36	<i>Chex-Wheat</i>	33
<i>Chex-Wheat</i>	27	<i>Chex-Corn</i>	32
<i>Kix-Honey</i>	23	<i>Wheaties-Regular/Original</i>	25
<i>Total-Whole Grain/Original</i>	21	<i>Total Whole Grain/Original</i>	24
<i>Wheaties-Regular/Original</i>	19	<i>Kix-Honey</i>	22
<i>Kix-Berry Berry</i>	12	<i>Chex-Multi-Bran</i>	15
<i>Dora the Explorer</i>	12	<i>Fiber One</i>	5
<i>Cheerios-Dulce de Leche</i>	10	<i>Dora the Explorer</i>	2
<i>Fiber One-Honey Clusters</i>	6	<i>Total Cinnamon Crunch</i>	1
<i>Chex-Multi-Bran</i>	5		
<i>Fiber One-Caramel Delight</i>	4		
<i>Fiber One-Frosted Shredded Wheat</i>	3		
<i>Go Diego Go!</i>	3		
<i>Country Corn Flakes</i>	1		
<i>Kaboom</i>	1		
<b>Kellogg's</b>		<b>Kellogg's</b>	
<i>Corn Flakes</i>	41	<i>Corn Flakes</i>	43
<i>Mini-Wheats, Frosted-Bite Size</i>	35	<i>Mini-Wheats, Frosted-Bite Size</i>	28
<i>Rice Krispies</i>	28	<i>Mini-Wheats, Unfrosted-Bite Size</i>	27
<i>Complete All-Bran Wheat Flakes</i>	26	<i>Rice Krispies</i>	26
<i>Special K</i>	25	<i>Complete All-Bran Wheat Flakes</i>	23
<i>Mini-Wheats, Frosted-Big Bite</i>	22	<i>Mini-Wheats, Frosted-Big Bite</i>	23
<i>Mini-Wheats, Unfrosted</i>	21	<i>Crispix</i>	19
<i>Crispix</i>	18	<i>Special K</i>	19
<i>Mini-Wheats, Frosted-Little Bite</i>	16	<i>Product 19</i>	6
<i>Rice Krispies-Gluten Free</i>	15	<i>Special K-Protein Plus</i>	2
<i>Scooby-Doo</i>	9	<i>Corn Flakes-Touch of Honey</i>	1
<i>Mini-Wheats, Frosted-Touch of Fruit in the Middle: Raspberry</i>	6		
<i>Mini-Wheats, Frosted-Touch of Fruit in the Middle: Mixed Berry</i>	6	<b>Kashi</b>	
<i>Product 19</i>	4	<i>Mighty Bites Honey Crunch</i>	3
<i>Special K-Multi-Grain</i>	2		

Continued—

**National-brand breakfast cold cereals authorized by State WIC agencies in 2010 and from fall 2014 to spring 2015—continued**

Fall 2014 to spring 2015		2010	
Cereal product (manufacturer/product name) (72 in total)	Number of States	Cereal product (manufacturer/product name) (52 in total)	Number of States
<b>Kellogg's</b>			
<i>Special K-Protein Plus</i>	2		
<i>Mini-Wheats, Frosted-Touch of Fruit in the Middle: Raisin</i>	2		
<b>Post</b>		<b>Post</b>	
<i>Honey Bunches of Oats-Honey Roasted</i>	32	<i>Grape Nuts Cereal</i>	33
<i>Grape Nuts</i>	32	<i>Honey Bunches of Oats-Honey Roasted</i>	29
<i>Grape Nuts-Flakes</i>	29	<i>Bran Flakes</i>	27
<i>Honey Bunches of Oats-Almonds</i>	27	<i>Grape Nuts Flakes</i>	27
<i>Bran Flakes</i>	26	<i>Honey Bunches of Oats-Almonds</i>	25
<i>Honey Bunches of Oats-Vanilla Bunches</i>	22	<i>Banana Nut Crunch</i>	23
<i>Great Grains-Banana Nut Crunch</i>	19	<i>Honey Bunches of Oats-Vanilla Bunches</i>	23
<i>Honey Bunches of Oats-Cinnamon Bunches</i>	17	<i>Honey Bunches of Oats-Cinnamon Bunches</i>	11
<i>Shredded Wheat-Honey Nut</i>	9	<i>Honey Bunches of Oats-Regular</i>	3
<i>Alpha Bits</i>	6	<i>Grape Nuts Trail Mix Crunch, Maple Nut &amp; Brown Sugar</i>	2
<i>Shredded Wheat-Lightly Frosted</i>	5	<i>Shredded Wheat -Vanilla Almond</i>	2
<i>Great Grains-Protein Blend, Cinnamon Hazelnut</i>	3	<i>Trail Mix Crunch, Raisin &amp; Almond</i>	2
<i>Great Grains-Protein Blend, Honey Oats &amp; Seeds</i>	3		
<i>Honey Bunches of Oats-Fruit Blends, Peach Raspberry</i>	2		
<i>Honey Bunches of Oats-Fruit Blends, Banana Blueberry</i>	1		
<i>Honey Bunches of Oats-Fruit Blends, Mango Coconut</i>	1		
<i>Honey Bunches of Oats-Honey Crunch, Whole Grain</i>	1		
<i>Grape Nuts-Fit Cranberry Vanilla Crunch</i>	1		
<b>MOM</b>		<b>MOM</b>	
<i>Mini Spooners-Frosted</i>	36	<i>Mini Spooners-Frosted</i>	31
<i>Crispy Rice</i>	31	<i>Crispy Rice</i>	20
<i>Oat Blenders with Honey</i>	24	<i>Honey and Oat Blenders</i>	14
<i>Mini Spooners-Strawberry Cream</i>	20	<i>Mini Spooners-Strawberry Cream</i>	12
<i>Oat Blenders with Honey and Almonds</i>	20	<i>Honey and Oat Blenders, Almonds</i>	9
<i>Mini Spooners-Blueberry</i>	14	<i>Mini Spooners-Maple &amp; Brown Sugar</i>	1
<i>Mom's Best Naturals-Oats &amp; Honey Blend</i>	1	<i>Mini Spooners-Vanilla Cream</i>	1
		<i>Scooters</i>	1

Continued—



**National-brand breakfast cold cereals authorized by State WIC agencies in 2010 and from fall 2014 to spring 2015—continued**

Fall 2014 to spring 2015		2010	
Cereal product (manufacturer/product name) (72 in total)	Number of States	Cereal product (manufacturer/product name) (52 in total)	Number of States
<b>Quaker</b>		<b>Quaker</b>	
<i>Life Cereal</i>	38	<i>Life</i>	39
<i>Oatmeal Squares-Brown Sugar</i>	24	<i>Oatmeal Squares-Cinnamon</i>	22
<i>Oatmeal Squares-Cinnamon</i>	23	<i>Oatmeal Squares-Brown Sugar</i>	21
<i>Oatmeal Squares-Plain, Toasted</i>	4	<i>King Vitaman</i>	11
<i>King Vitaman</i>	4	<i>Oatmeal Squares</i>	9
<i>Oat Bran</i>	3	<i>Crunchy Corn Bran</i>	5
<i>Crunchy Corn Bran</i>	3	<i>Oat Bran</i>	5
<i>Oatmeal Squares-Golden Maple</i>	1		
<i>Oatmeal Squares-Honey Nut</i>	1		
<i>Toasted Multigrain Crisps</i>	1		
<b>Sunbelt Bakery</b>			
<i>Simple Granola</i>	6		

WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Source: Data for 2014-15 were collected by USDA, Economic Research Service, from the websites of WIC State agencies. Data for 2010 are from *WIC Food Package Policy Options Study—Final Report* (U.S. Department of Agriculture, Food and Nutrition Service, 2011).

Appendix table A-2

**Number of cold breakfast cereals allowed by State WIC agencies in 2010 versus fall 2014 to spring 2015**

State	Number of national brands allowed		State	Number of national brands allowed	
	Fall 2014 to spring 2015	2010		Fall 2014 to spring 2015	2010
Alabama	21	16	Montana	17	18
Alaska	13	11	Nebraska	23	17
Arizona	23	22	Nevada	24	17
Arkansas	31	24	New Hampshire	33	21
California	18	15	New Jersey	21	18
Colorado	13	23	New Mexico	31	26
Connecticut	15	16	New York	13	10
Delaware	10	31	North Carolina	31	23
DC	40	10	North Dakota	22	23
Florida	32	22	Ohio	25	22
Georgia	27	23	Oklahoma	32	25
Hawaii	8	7	Oregon	26	23
Idaho	12	10	Pennsylvania	40	34
Illinois	16	16	Rhode Island	20	19
Indiana	28	28	South Carolina	23	16
Iowa	20	19	South Dakota	15	8
Kansas	28	27	Tennessee	41	34
Kentucky	26	23	Texas	21	15
Louisiana	10	11	Utah	6	19
Maine	28	21	Virginia	0	2
Maryland	22	24	Washington	10	10
Massachusetts	39	25	West Virginia	26	25
Michigan	33	22	Wisconsin	31	29
Minnesota	29	28	Wyoming	23	18
Missouri	0	0			

WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Source: Data for 2014-15 were collected by USDA, Economic Research Service, from the websites of WIC State agencies. Data for 2010 are from *WIC Food Package Policy Options Study—Final Report* (U.S. Department of Agriculture, Food and Nutrition Service, 2011).