Chapter 4
Food Costs and Food Cost Savings

The primary purpose of imposing restrictions on allowed WIC foods is to lower costs while maintaining nutrient benefits set by Federal standards. Little is known, however, about the magnitude of food cost savings resulting from cost-containment practices. Program officials in the six States in this study had very limited financial information on the savings from the food-item restrictions they had implemented. (Many of these restrictions have been in effect for some years, so information on food costs before their implementation is no longer available.) Nevertheless, the estimates provided by the program officials are included in this chapter, both to provide context for the systematic analyses conducted for this study and to fill in a few gaps in available data.

Food-item restrictions limit, to varying degrees, the types, brands, or package forms of food items that WIC participants may purchase with their food instruments. The savings from food-item restrictions are equal to the difference between food costs that would be incurred in the absence of restrictions and the actual food costs incurred with restrictions. The food costs that would be incurred without restrictions (the counterfactual), however, cannot be observed directly.

To illustrate the problem, consider the Connecticut practice requiring purchase of the least expensive brand of orange and grapefruit juice. WIC participants purchasing orange or grapefruit juice must select the least cost brand in the store where they shop; for other types of juice (apple, grape, pineapple, juice blends) they select from the national brands listed on the WIC food list. For any given WIC participant, the savings from this restriction depends on four factors. Does their WIC prescription include juice (and, if so, how much is prescribed)? Do they purchase orange or grapefruit juice? What brand of orange juice would they purchase if unrestrained? What is the price difference between the preferred brand and the least cost brand in the store where they shop?

Three of these four factors are observable: food prescriptions, current juice selections, and prices. State WIC agency administrative data contain information about food package prescriptions for each WIC participant. Supermarket scanner data collected for this study indicate the percent of WIC juice selections that were orange or grapefruit juice, and the Survey of Food Prices and Item Availability conducted for this study collected prices of all juice brands stocked by a sample of WIC-authorized vendors in each of the six States.[1]

One cannot, however, observe the juice preferences of Connecticut WIC participants in a world in which they are not constrained by the State's least expensive restriction on orange and grapefruit juice. This restriction affects the brands of orange and grapefruit juice purchased with WIC food instruments, and also the types of juice purchased. Presence of a restriction on orange juice does not shift all orange juice purchases to the least cost orange juice; it may shift some orange juice purchases to national-brand apple juice and other types of juice.[2]

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[1] The final sample includes 17 to 18 WIC-authorized vendors in each State, including supermarkets and smaller grocery stores. In each State, prices were collected for all juice brands approved for WIC purchase in any of the six States (as well as prices for other WIC foods).

[2] For example, a person may rank their preferred juices as: national-brand orange (#1), national-brand apple (#2), store-brand orange (#3).

Estimation of the food cost savings from food-item restrictions on juice requires some assumptions about the counterfactual distribution of juices that would be purchased if there were no restrictions. This study used information about juice selections by WIC participants in study States that did not impose restrictions on juice (North Carolina and Ohio) as a proxy for the counterfactual distribution of purchases (and likewise for all other food categories). Admittedly, use of out-of-State data on food preferences poses problems that may introduce error in the estimates of food cost savings. First, if preferences vary significantly across States because of differences in demographics or food markets, the proxy distribution may not adequately represent what participants in the restricted State would have purchased in the absence of restrictions. Second, compared to foods allowed under Federal regulations, even "nonrestricted" States limit the number of food items allowed (to reduce the management task of periodically confirming that allowed foods meet nutrient standards). Thus, the counterfactual may not represent the full array of allowed foods in the absence of restrictions.

The study compensates for both problems by using as many of the study States as possible when constructing the counterfactual, thereby broadening the base of participants (and States) whose preferences (food lists) are used. Nevertheless, these two problems are likely to introduce some error in the study's estimates of food cost savings. The size and direction of any possible error are unknown, and they are likely to vary by food category because different States form the nonrestricted group for each food category.

It is important to recognize that potential errors in estimating food cost savings cannot be avoided without conducting an experiment that relaxes current restrictions in a State and observes the resulting changes in food item selection. Otherwise, it is not possible to know what foods and quantities participants would buy in the absence of food-item restrictions. It was not possible to conduct an experiment as part of this study, so using data on actual WIC purchases from nonrestricted States provided the best available approach to developing the needed counterfactual distribution of food purchases.

The next section of this chapter presents the research approach in detail. The final section presents analysis results.

Research Approach

Overview

Food-item restrictions yield food cost savings equal to the difference in food costs incurred **without** those item restrictions (the counterfactual) and food costs incurred **with** those restrictions. As discussed in previous chapters, the States in this study implemented different numbers and combinations of restrictions across food categories. Table 3-1 in chapter 3 summarized the item restrictions.

For a given food category, the total monthly savings from item restrictions can be expressed as:

$$TotalSaving_F = N_F \overline{Q}_F \left[\sum_{i=1}^{I+R} \alpha_i' \overline{P}_i - \sum_{i=1}^{I} \alpha_i \overline{P}_i \right] \quad (1)$$

where: F = food category,

N_F = number of WIC participants prescribed food in category F

Q_F = average monthly quantity prescribed for food category F

I = number of food items on the State WIC-approved food list in category F

R = number of restricted food items (Federally approved items not on food list) in category F

α_i' = percent of food selections in category F of item i, when unrestricted (unobservable)

α_i = percent of food selections in category F of item i, when restricted (observable)

$\overline{P}_i$ = average price of item i

The first component in the square brackets is the average price of all items within a food category, including items on the State food list (I) and restricted items (R)—this term is the counterfactual, and it represents all Federal (unrestricted) WIC food items within a food category. The second component in the brackets is the average price of items on the State food list (I). Thus, the quantity within the brackets is the average price differential resulting from food-item restrictions within a food category. In States with no restrictions R = 0, and the price differential from restrictions is zero. The savings estimated by equation (1) are monthly savings because the quantity term Q_F is expressed as the monthly quantity prescribed for category F.

Total savings from food-item restrictions within a State are equal to the sum of savings in all food categories. The food categories examined are milk, eggs, cheese, breakfast cereal, infant cereal, single-strength juice, infant juice, and legumes (peanut butter and dried beans or peas). As specified in the study's authorizing legislation, savings from infant formula rebates are not examined. In addition, none of the case study States imposed food-item restrictions on tuna or carrots, so these food categories are not included in the analysis.

Equation (1) is a simplified form of the estimation equation, because there is no accounting for the weighting necessary to calculate average food prices and average food quantities. Nonetheless, it is useful for discussing the data sources used in this analysis:

- **WIC administrative data** provide information on the number of WIC participants prescribed each food category (N_F), and the quantity of food of each food category prescribed to each participant (Q_F). Administrative data reflect WIC caseloads in November 2000.
- The **Survey of Food Prices and Item Availability** provides food price data (P_i). Food prices were collected from a sample of 106 WIC vendors (17 or 18 stores in each of six states) during a single store visit in March or April 2001. Prices were collected for the same list of WIC food items in each State, with the list containing items approved by WIC in any of the six States. As a result, price data from each State include both items on the State's WIC food list and not on the list, but Federally approved (restricted items).
- **Supermarket scanner data** provide information on WIC participants' preferences over food items within each food category, conditional on the list of WIC-approved foods in their State (α_i). Scanner data were collected from six supermarket chains in five States

over a 6-week period in late February through mid-March 2001.[3] The scanner data provide the percentage distribution of food item selections (the α_i vector) for five of the six States; this distribution of items was presented in chapter 3 (table 3-4).[4]

- The **Survey of WIC Participants** provides information on WIC participants' preferences over food items within each food category, conditional on the list of WIC-approved foods in their State (α_i). In Oklahoma, where scanner data were not available, survey data are used to construct the percentage distribution of item selections (table 3-2).[5]

The one element of equation (1) that is not observable from existing data is α'_i—the preferences of WIC participants over an unconstrained list of WIC-approved food items. For example, the study does not know the number (or percent) of Connecticut WIC participants who would have purchased other brands of orange juice if the State's least expensive policy did not exist.

The study therefore assumes that the α'_i vector for each food category, although not directly observed within each State, can be approximated by the α_i vector from States without restrictions on the food category. For example, North Carolina and Ohio do not have item restrictions on juice—both States allow a large number of juice types and a wide array of brands, with no least expensive policies. The α_i vector from these two States provides the counterfactual α'_i vector for juice in Connecticut (and other States with juice restrictions).

Additional assumptions are made in estimating food cost savings. First, the estimated costs for this study exclude the costs of infant formula, tuna, and carrots. Formula was specifically excluded from the study by the authorizing legislation; tuna and carrots are not subject to cost-containment item restrictions in any State and do not contribute to food cost savings.

Second, the estimated costs assume that all food instruments are redeemed. As discussed later in chapter 8, an average of about 16 percent of all food instruments issued for November 2000 in the six States were never redeemed, and this acts to lower actual average food package costs.

Third, the estimated costs assume full redemption of each food instrument. Survey data and anecdotal evidence suggest that participants sometimes purchase only some of the items listed on a food instrument, but empirically based estimates of the frequency of partial redemptions or their impact on food package costs are not available. As with the assumption that all food instruments were redeemed, this assumption of full redemption of each instrument results in estimated food package costs that exceed actual food package costs.

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[3] The number of WIC transactions in the collected scanner data range from 4,700 in Connecticut to over 225,000 in both North Carolina and Texas. The total number of selected food items observed in the scanner data range from 18,300 in Connecticut to over 400,000 in Texas and over 900,000 in North Carolina. No scanner data were available for Oklahoma.

[4] Table 3-4 presents the percentage distribution of item selections aggregated into subcategories. The unaggregated distribution was used for the analyses in this chapter.

[5] The Survey of WIC Participants asked respondents to recall the brand, type, and package size of items purchased "last month" with WIC food instruments. The number of respondents per State varied from 203 (Texas) to 231 (Connecticut). The survey data have the limitation, however, of indicating only the items that were purchased, not the quantities. The analysis therefore used only a respondent's first reported item in each food category when building the distribution of items purchased.

This chapter presents estimates of food costs and the savings from food-item restrictions for each food category and overall, for each of the six States in the study. Total savings are not estimated separately by type of item restriction when multiple restrictions affect the same food category because multiple item restrictions do not have independent impacts on the distribution of items selected within a food category (α_i).

An example of a food category with multiple item restrictions is juice in Connecticut. Connecticut has a least expensive policy for orange and grapefruit juice, as discussed above. Connecticut also limits the types of juice that may be purchased: three types of juice are not permitted in Connecticut (cranberry, tomato, vegetable), although these juices meet Federal WIC regulations and are allowed in other States. Only the combined impact of both restrictions is estimated because the restrictions are not independent. The least expensive restriction on orange juice has two effects relative to unconstrained item selections: (1) a shift in selections of orange and grapefruit juice from high-cost national brands to low-cost store brands and private labels, and (2) a shift in juice selections from orange and grapefruit to other juice types. The shift toward other juice types, however, may be dampened by the restriction on juice types: participants who like cranberry juice cannot choose cranberry juice instead of low-cost orange juice. The actual overall distribution of juice purchases is determined by all restrictions on the food category.

Standardized and Nonstandardized Estimates

The goal in analyzing WIC food costs (and food cost savings) is to obtain estimates of average food costs that vary across States due only to variation in food prices, allowable foods, and participant preferences among allowable foods. To allow comparison of food costs and savings across States, estimates in this chapter are **standardized** to remove cross-State differences in costs unrelated to prices, preferences, or food-item restrictions. Specifically, as described below, the estimates are standardized to remove three sources of cross-State variation: caseload size, differences in the distribution of WIC participants across certification category and food package, and differences in the amount of food package tailoring used by the State.

1. All estimates in this chapter are presented as food costs and food cost savings per participant per month (PPM), using the entire caseload as the denominator. This may seem strange when looking at restrictions on infant cereal, because the savings per infant are "diluted" when spread over all participants. This standardization, however, allows meaningful comparison (and summation) of food costs and savings among food categories. It also facilitates comparison across States with different numbers of WIC participants.
2. Estimates of food costs are calculated for a standard distribution of WIC participants in each State, with the standard distribution equal to the average distribution of participants across certification categories in all six States. This removes cross-State differences in food costs due to different distributions of WIC participants across certification category.
3. Estimates of food costs are calculated based on the standard food packages prescribed by Federal WIC regulations for participants in each certification category. This removes cross-State differences in food costs due to different amounts of food package tailoring.

Standardization #2 is applied because prescribed food quantities depend on the distribution of WIC participants across certification categories. Federal WIC regulations specify seven food packages:

two for infants that are age-dependent (Food Packages I and II); one for children or women with special dietary needs (package III); one for children aged 1 to 5 years (IV); one for pregnant and breastfeeding women (V); one for nonbreastfeeding postpartum women (VI); and an enhanced package for breastfeeding women (VII).[6] Six of the seven food packages correspond closely to certification category, with food package III prescribed to a very small fraction of women and children.

Standardization # 3 is applied because State and local WIC agencies sometimes tailor food packages to meet the nutritional needs of individual WIC clients. Tailoring may reduce the amounts or types of food prescribed, and can thereby affect food package costs.

Application of these standardizations in the estimation procedure is discussed in the next section.

Estimation Procedure

According to equation (1), food cost savings in each food category are calculated as the difference between unconstrained (counterfactual) food costs and actual food costs. Equation (1) is a simplified form of the estimation equation, because there is no accounting for the weighting necessary to calculate average food prices and average food quantities. Price data are obtained from a weighted sample of 17 to 18 WIC retailers in each State; average food quantities are obtained by weighting the food quantities prescribed in each food package by the distribution of WIC participants across food packages.

A full representation of the estimation of average food costs per participant month is shown in equation (2). This representation includes appropriate weights.

$$AvgFoodCosts_F = \sum_{c=1}^{5} \delta_c \sum_{s=1}^{S} \omega_s \sum_{fp=1}^{FP} \left[\gamma_{fp_c} Q_{fp} \cdot \left(\sum_{i=1}^{I} \alpha_i P_{si} \right) \right] \quad (2)$$

where: F = food category,

c = 1 to 5, denotes certification category[7]

δ_c = percent of WIC participants in certification category *c*

S = number of stores sampled in the State for the Survey of Food Prices and Item Availability

ω_s = sampling weight for store *s*

FP = number of different food packages

γ_{fp_c} = percent of WIC participants in certification category *c*, prescribed food package *fp*

Q_{fp} = prescribed monthly quantity of food category F in food package *fp*

I = number of food items in category F on the State WIC food list (approved items)

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[6] The content of the seven food packages is shown in appendix H.

[7] Infants aged 0 to 3 months are excluded from the analysis because their prescriptions contain only infant formula.

α_i = percent of food selections in category F of item i (observable)

P_{si} = unit price of food item *i* in store *s*

$\sum_{i=1}^{I} \alpha_i P_{si}$ = average price per unit of food in food category F, at store *s*

Equation (2) yields the average food costs per participant month (PPM) given the State's list of approved WIC foods. Estimated counterfactual food costs, assuming no item restrictions, are obtained by equation (2′). Equation (2′) is obtained by substituting α'_i for α_i in equation (2), and calculating the average unit price of food over I + R items, where R is the number of restricted items not appearing on the State food list.

$$AvgFoodCosts'_F = \sum_{c=1}^{5} \delta_c \sum_{s=1}^{S} \omega_s \sum_{fp=1}^{FP} \left[\gamma_{fp_c} Q_{fp} \cdot \left(\sum_{i=1}^{I+R} \alpha'_i P_{si} \right) \right] \qquad (2')$$

Food cost savings per participant month are equal to the difference between equations (2′) and (2).[8]

The two terms within the square brackets are average quantity of food in the food category and average unit price. The average quantity is an average of food prescriptions, weighted by the distribution of WIC participants across food packages (this information is in WIC administrative data). The average price is an average unit price of all food items within the food category, stocked by store *s*, and weighted by the distribution of food item selections observed in the scanner data for the State.[9]

Three assumptions were made in applying the distribution of item selections to prices to obtain average prices. First, it is assumed that item preferences do not vary by certification category. It was not possible to measure item preferences (α_i) separately by certification category (note there is no subscript *c* on this term), because item preferences taken from scanner data could not be matched to the identity of individual WIC participants. This assumption does not affect the overall estimates of food costs for a State.

Second, the distribution of food selections (α_i) within a food category was adjusted to sum to 100 percent at each store so that average prices could be calculated regardless of the number of items stocked by the store. For example, suppose the scanner data indicated the following percentage distribution of cereal purchases in unrestricted States: Cheerios (25), Kellogg's Corn Flakes (30), Kix (25), Rice Chex (10), and Quaker Oat Bran (10). If a store in a restricted State did not stock Quaker Oat Bran, the percentages for all other cereals would be increased by 100/90, or 11.1 percent. This adjustment implicitly assumes that the relative ranking of item preferences is independent of

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8 Equations (2) and (2′) show a summation over certification categories and food packages. The summation by certification category would allow presentation of food costs by certification category, but otherwise is not needed (the c subscript would then be taken off γ_{fp_c}).

9 The price of each item in the Survey of Food Prices and Item availability was converted to a unit price, where the units were gallon of milk, pound of cheese, 18-ounce jar of peanut butter, ounce of adult cereal, 8-ounce box of infant cereal, and 46-fluid ounce equivalent of infant and single-strength juice.

Federal regulations (CFR 246.10) specify juice amounts in units of adult single-strength juice, with all amounts divisible by 46 ounces, which is the standard container size (see appendix H).

alternatives. The assumption provides for comparisons of average prices in smaller grocery stores that lack a full range of products.

Third, it was assumed that item preferences for cheese and juice are hierarchical; in other words, when separately applying the restricted item distribution (α_i) and the unrestricted item distribution (α'_i) to store prices, an individual's preference for type (Cheddar vs. Colby vs. Swiss) took precedence over the preference for brand. This assumption was applied to cheese and juice because of the large variety of specific brands in these categories. Cheese and juice are available in a large number of national and regional brands, but any single store typically stocks a limited number of brands. As a result, the items observed in the scanner data (the α_i vector) do not coincide perfectly with the items observed on the food price survey for individual stores. In order to provide weights to the items stocked in stores, the item distribution observed in the scanner data was allocated in a hierarchical fashion.[10]

Finally, it should be noted that the impact of a cost-containment item restriction on food costs could not be evaluated if the restriction was present in all six case study States. For example, all States prohibited purchase of cheese in shredded, cubed, and string forms. This restriction could not be evaluated because a counterfactual distribution of item selections (α'_i) including these package forms did not exist among the six States.

The estimated cost of all food packages (total term in the square brackets) was determined for each store, and the average cost across stores was weighted by the sampling weights from the Survey of Food Prices and Item Availability (ω_s).

Equations (2) and (2′) were each calculated twice for each food category in each State to obtain:

- Standardized average food costs—using standard food package contents and standard distribution of participants across certification categories
- Nonstandardized average food costs—using actual food package contents and actual distribution of participants across certification categories (δ_c)

Differences across States in standardized average food costs reflect prices, allowable foods, and preferences over allowable foods. Differences across States in nonstandardized average food costs reflect prices, allowable foods, preferences over allowable foods, differences in the distribution of participants across certification category, and differences across States in food package tailoring.

When calculating standardized food costs, the standard distribution of participants across certification categories (δ_c) is the average distribution among the six case study States, as shown in table 4-1.[11] The standard food package contents are taken from Federal regulations (see appendix H). For both standardized and nonstandardized food costs, estimated food costs are based on all WIC foods except

[10] For example, suppose the scanner data showed that 25 percent of juice purchases in Connecticut were apple juice. Further, among apple juice purchases, 25 percent were store brand, 25 percent were Minute Maid, 15 percent were Seneca, and 35 percent were Juicy Juice. If a Connecticut store in the survey did not stock Minute Maid apple juice, the weight of Minute Maid apple juice was reallocated to all other apple juices, not all other juices of any type.

[11] Components of the average distribution shown in table 4-1 were rounded to the nearest whole number when standardizing estimates.

infant formula, tuna, and carrots. The exclusion of formula, tuna, and carrots from estimation of actual and counterfactual food costs reduces estimated costs relative to true food costs, but estimates of food cost savings are not affected by these exclusions.

Table 4-1—Distribution of WIC participants in the six case study States

Certification category	CA	CT	NC	OH	OK	TX	Average
				Percent			
Pregnant	10.2	10.6	11.2	10.8	12.9	10.4	11.0
Breastfeeding	7.6	3.2	4.9	3.6	4.3	6.5	5.0
Postpartum	7.0	5.0	9.2	8.3	7.3	8.4	7.5
Infants	21.5	28.6	28.5	30.5	27.9	26.8	27.3
Children	53.7	52.6	46.2	46.7	47.6	47.9	49.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Totals may not sum to 100 percent due to rounding.

Source*:* State administrative files, November 2000.

For both standardized and nonstandardized food costs, food package I does not enter the analyses because it contains only infant formula. Food package II contains infant formula, infant cereal, and juice; only infant cereal and juice are included in estimated average food costs. Food package VII contains tuna and carrots, in addition to milk, cheese, eggs, cereal, juice, and legumes; all items except tuna and carrots are included in estimated average food costs. For standardized food costs, it was assumed that half of breastfeeding women received food package V and half received food package VII.

Food package III is prescribed for women and children with special dietary needs and it includes formula, cereal, and juice. This food package is prescribed to a very small fraction of the caseload in the six case study States; the percent of women and children receiving special food packages was identified by a formula prescription and ranged from 0.27 to 1.55 percent in the six States. Food package III is included in estimation of nonstandardized average food costs (excluding formula costs), but due to the small fraction of participants receiving this food package, it was excluded from standardized food costs.

Analysis Results

Using the approach described above, table 4-2 presents estimated average standardized food costs by category for each State in the study. Total estimated costs varied from a low of $26.01 PPM in Oklahoma to a high of $36.39 PPM in California. These estimates reflect the food-item restrictions imposed by the States, as well as within-State food prices and preferences (conditional on the restrictions). The distribution of participants across certification categories and food packages is the same for each State.

For comparison purposes, estimates of total nonstandardized costs in the six States are $35.72 PPM in California, $35.04 PPM in Connecticut, $26.72 PPM in North Carolina, $27.93 PPM in Ohio, $24.26

PPM in Oklahoma, and $26.97 PPM in Texas.[12] Except for Texas, the estimates of nonstandardized costs are lower than for standardized costs. This is largely due to the effects of tailoring; although States are not allowed to tailor food packages for the purpose of reducing costs, tailoring will lower food package costs when prescribed quantities of food are reduced.

Among the six States, milk represented about 31 percent of total estimated nonstandardized costs. In descending order, the percentage of food package costs represented by the other categories were juice (22 percent), cereal (18 percent), cheese (16 percent), eggs (6 percent), legumes (3 percent), infant juice (2 percent), and infant cereal (2 percent). The percentage distribution of standardized food category costs in table 4-2, averaged over the six States, is very nearly the same.

Table 4-2—Average standardized food category costs per participant month (PPM)

Food category	CA	CT	NC	OH	OK	TX
			Dollars			
Milk	11.94	10.41	10.38	8.96	8.79	9.19
Eggs	2.19	2.10	1.72	1.49	1.32	1.56
Cheese	5.20	5.17	5.57	5.62	4.29	5.80
Cereal	5.56	8.03	5.12	6.61	3.10	4.23
Infant cereal[a]	0.48	0.49	0.80	0.82	0.72	0.45
Juice	9.36	7.67	8.57	7.49	6.34	4.33
Infant juice	0.56	0.61	0.69	0.75	0.63	0.35
Legumes	1.10	1.00	0.90	1.05	0.83	0.82
Total	36.39	35.48	33.76	32.80	26.01	26.72

a Infant cereal costs include effects of manufacturer's rebate in California, Connecticut, and Texas.

Average food category costs may not sum to total due to rounding.

Sources: Survey of Food Prices and Item Availability, WIC transaction data from supermarkets, and State administrative data from November 2000.

Table 4-3 presents estimates of cost savings from the six States' implementation of food-item restrictions, based on use of standardized food packages (that is, no tailoring) and a standard distribution of participants across certification categories. That is, the estimated savings have been standardized to better facilitate comparison of savings across States. Variations in costs and cost savings due to State differences in certification category and food package contents have been removed.

In table 4-3, a blank cell represents a State that was used to estimate the counterfactual distribution of purchases in the absence of food-item restrictions. Thus, for example, table 4-3 shows estimated milk savings for Ohio and Oklahoma, which limited most milk purchases to gallon containers. Participant purchase patterns in the four States with no cell entry for milk (California, Connecticut, North Carolina, and Texas) were used to develop the counterfactual distribution.[13]

[12] The estimates for both standardized food costs and nonstandardized costs exclude the cost of infant formula, tuna, and carrots.

[13] The counterfactual distribution was calculated as the average of the four State-specific distributions.

The estimated savings in each food category in table 4-3 are discussed separately below. Overall, however, total savings per participant per month varied from –$0.08 PPM in North Carolina to $6.14 in OK and $6.82 PPM in Texas (the negative savings in North Carolina are explained below). In terms of the size of the savings among different food categories, food-item restrictions on cheese, breakfast cereal, and juice generated the largest savings in these States. The estimated savings in table 4-3 for restrictions on milk and eggs are conservative because savings from least expensive brand policies could not be estimated for these two food categories.[14]

Table 4-3—Estimated food cost savings per participant month, based on standardized food packages and a standard distribution of participants among certification categories

Food category	CA	CT	NC	OH	OK	TX
			Dollars			
Milk[a]				0.10	0.32	
Eggs[b]	0.15	0.08			0.13	0.10
Cheese	0.11	1.07			1.16	
Cereal	0.87				2.82	1.99
Infant cereal[c]	0.32	0.37				0.27
Juice	0.83[d]	1.76			1.68	4.19
Infant juice	0.20	–0.26	–0.08			0.28
Legumes		0.08			0.03	
Total	2.48	3.09	–0.08	0.10	6.14	6.82

a Savings from least expensive brand policies in Connecticut, North Carolina, Oklahoma, and Texas could not be estimated. See text for discussion of California's cost-containment practices for milk and the State's estimates of savings.

b Savings from least expensive brand policies in Connecticut and Oklahoma could not be estimated.

c Savings estimates include effects of manufacturer's rebates in California, Connecticut, and Texas.

d Estimated as a "reverse counterfactual" because sampled stores from California did not stock a 46-ounce plastic container of juice, which was a commonly purchased container in the unrestricted States of North Carolina and Ohio.

Blank cells in the table represent States whose participant preferences were used to estimate savings in States with restrictions.

Savings by food category may not sum to total because of rounding.

Milk

Ohio and Oklahoma limited most milk purchases to gallon containers. This restriction yielded savings of $0.10 PPM in Ohio and $0.32 PPM in Oklahoma. The estimated savings are greater in Oklahoma because the average price difference between one gallon of milk and two half-gallons was larger in Oklahoma than in Ohio.

Connecticut, North Carolina, Oklahoma, and Texas required WIC participants to purchase the least expensive brand of milk available in the store. Savings from this policy are not estimated because the

[14] In categories with less branding, however, savings are likely to be small.

Survey of Food Prices and Item Availability collected price data only for the least expensive brand of milk in the store. Thus, the estimated savings for food-item restrictions on milk are conservative estimates. That is, the savings in Oklahoma are probably greater than $0.32 PPM, and positive savings probably exist in Connecticut, North Carolina, and Texas.[15]

California is treated in this analysis as having no restrictions on milk purchases because some participants were allowed to purchase milk in half-gallon containers. The State, however, had two policies intended to contain milk costs. First, the food package formulation and associated redemption rules were designed to minimize purchases of half-gallon and smaller containers. Most commonly, milk was included in a "dairy combo" food instrument in a two-gallon quantity. Participants were required to purchase the milk in gallon sizes and encouraged to buy two-gallon "economy packs." If a food instrument was issued with a one-and-one-half gallon quantity of milk, the participant could buy one gallon and one half-gallon.[16] Second, the State updated maximum values for food instruments containing milk on a monthly basis, using a formula linked to the farm price of milk. For FY2000, the State estimated that it saved $5.5 million because of the "dairy combo" food instrument and $9.0 million because of its maximum value system for food instruments containing milk. These savings equate to $0.38 PPM and $0.63 PPM, respectively.[17] California also had a least cost restriction for milk in FY2000, with estimated savings of $6.0 million, but the State ended this restriction early in FY2001 because of vendor and participant confusion.

Eggs

California, Connecticut, Oklahoma, and Texas prohibited purchase of extra-large or jumbo eggs, which are the most expensive types. Oklahoma required the purchase of medium eggs, allowing large eggs only if medium were not available. These restrictions led to estimated savings of $0.15 PPM in California, $0.08 PPM in Connecticut, $0.13 PPM in Oklahoma, and $0.10 PPM in Texas.

Connecticut and Oklahoma also required purchase of the least expensive brand of eggs. As with the least expensive brand policies for milk, cost savings due to this restriction are not evaluated here because of data limitations. The estimated savings in table 4-3 for Connecticut and Oklahoma for egg restrictions are therefore conservative estimates.[18]

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[15] Oklahoma estimates that it saves about $600,000 per year (or $0.57 PPM) because of its least expensive brand milk policy. This estimate reflects the actual distribution of participants and purchases, so it is not directly comparable to the evaluation's estimate. The State did not have an estimate of the savings from requiring purchase in gallon containers.

[16] Scanner data from California supermarkets indicate that 7.2 percent of all milk containers were half gallons (table 3-4 in chapter 3)

[17] These estimates reflect the actual distribution of participants and purchases, so they are not directly comparable to the evaluation's estimates. Furthermore, supporting data for the State's estimate were not available to verify their accuracy.

[18] Oklahoma estimates that it saved about $200,000 per year (or $0.19 PPM) because of its least expensive brand egg policy. This estimate may also reflect the State's limit on egg size. This estimate reflects the actual distribution of participants and purchases, so it is not directly comparable to the evaluation's estimate.

Cheese

Connecticut and Oklahoma are the only two States in the group to require purchase of the least expensive brand of cheese in the store. Because a large share of cheese is nationally branded, the Survey of Food Prices and Item Availability collected price data on different brands of allowed cheese in each State, including store-brand and private-label items. Estimated savings from the least expensive brand policy on cheese were $1.05 PPM in Connecticut and $1.24 PPM in Oklahoma.[19]

Compared to the other States, California limited the number of allowed cheeses (table 3-1). This limitation led to estimated savings of $0.11 PPM.[20]

Legumes

Peanut butter and dried beans/peas both satisfy the food package prescription for legumes, as specified in Federal regulations (food packages with legumes include 18 ounces of peanut butter or 1 pound of dried beans or peas). States generally prescribe either peanut butter or dried beans/peas to participants according to participant preferences.[21] Because the food actually prescribed results from participant preferences, peanut butter and dried beans/peas are analyzed together in the legume category.[22] In analyzing standard food package contents (as specified in the regulations), it is assumed that half of legume prescriptions are peanut butter and half are dried beans/ peas.

With regard to food-item restrictions for legumes, Connecticut required purchase of the least expensive brand of peanut butter and Oklahoma required purchase of the least expensive brand of dried beans/peas. Basing the counterfactual distributions of purchases on the 50/50 split noted above, the estimated savings were $0.08 PPM in Connecticut and $0.03 PPM in Oklahoma.

Cereal

Three of the six case study States—California, Oklahoma, and Texas—imposed relatively stringent restrictions on breakfast cereals, but each State took a different approach. Table 3-1 in chapter 3 shows that, with the exception of a few hot cereals, the Oklahoma WIC program allowed purchase of only store-brand or private-label cereals. California allowed nationally branded cereals, but the number of different cereals allowed was smaller than in the other four States. Finally, Texas allowed a large number of cereal types and brands, but its specified minimum package sizes for cereals were

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19 Oklahoma estimates that it saved about $1 per pound of cheese because of its least expensive brand cheese policy. The State did not provide an annual estimate of savings.

20 The chapter noted earlier that, when multiple restrictions were present, separate estimates of savings from each restriction could not be presented. Here, separate estimates for savings from least expensive brand policies and limits on allowed cheeses are possible because the restrictions are in different States. It is only when multiple restrictions act together (in the same State) that their separate effects cannot be estimated.

21 Although States sometimes prescribe peanut butter and dried beans/peas in alternate months as a cost-cutting measure, none of the six States in this study alternated prescriptions of peanut better and dried beans/peas.

22 For all States except California, food package codes correspond to either peanut butter or dried beans/peas (that is, participant preferences are determined prior to assigning a food package code). California food package codes correspond to "peanut butter or dried beans/peas," and the choice is made when the food instruments are printed.

generally larger than in the other States. The intent was to achieve savings by buying cereal in larger sizes, which generally cost less per ounce.[23]

The analysis indicates that all three approaches led to cost savings. The savings presented in table 4-3 are $0.87 PPM in California, $2.82 PPM in Oklahoma, and $1.99 PPM in Texas.[24]

Infant Cereal

California, Connecticut, and Texas limited purchase of infant cereal to one brand. Each State received a rebate from the manufacturer for every box of Gerber infant cereal purchased with WIC food instruments. Chapter 2 presented an analysis of the size of the rebates; in FY2000, the average rebates for infant cereal were $3.95 per participant per year in California, $4.48 in Connecticut, and $3.22 in Texas. On a per participant per month basis, these rebates equaled $0.33 PPM in California, $0.37 PPM in Connecticut, and $0.27 PPM in Texas.[25]

Using the analysis approach developed for all food categories, the study found virtually no direct cost savings from the brand restrictions on infant cereal (prices in different States varied little by brand). Thus, the rebates represent the estimated cost savings of $0.32 PPM in California, $0.37 PPM in Connecticut, and $0.27 PPM in Texas.[26] Recall that, as with the analyses of all food categories in this chapter, the savings are averaged over all participants, not just those for whom the food item was prescribed.

Juice

Four of the six States (California, Connecticut, Oklahoma, and Texas) imposed restrictions on juice purchases, by type, brand, or container type (see table 3-1).

With respect to brand restrictions, Oklahoma required purchase of store- or private-label brands for most allowed juice. Connecticut and Texas required purchase of the least expensive available brand of some or all juice types.

All six States allowed purchase of five basic juice types: apple, grape, orange, pineapple, and white grape. California allowed only one additional type (vegetable), and Texas allowed two additional types (grapefruit and vegetable). The other four States allowed many more types, including blends of flavors.

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[23] Table 3-4 in chapter 3 shows that WIC participants in both Texas and California generally bought larger packages of cereal than participants in the other States.

[24] Oklahoma estimates that it saves $1.8 million to $2.1 million per year because of its cereal restrictions, or about $1.86 PPM. California estimates that its cereal restrictions saved $0.25 PPM in FY2000. Supporting data for these estimates were not provided, and they are not standardized by participant category distribution and food prescription.

[25] Note that these estimates are savings per participant month (PPM), not per box of infant cereal purchased. Averaged over just infants, the estimated savings would be $1.22 per month in California, $1.37 in Connecticut, and $1.00 in Texas.

[26] The restriction on infant cereal in California led to extra costs equal to $0.01 PPM, with Gerber cereal costing just a little more in California than the other brands. With the rebate of $0.33 PPM in California, estimated net savings were $0.32 PPM.

With respect to package size and form, all States allowed purchase of both frozen and shelf-stable juices. North Carolina, Ohio, and Oklahoma also allowed shelf-stable liquid concentrate. All States except California required most shelf-stable, regular-strength juice to be purchased in 46-ounce containers,[27] whereas California limited purchases of shelf-stable juices to 64-ounce containers. North Carolina and Ohio were the only two States to allow purchase of shelf-stable juice in either cans or plastic bottles. Oklahoma and Texas limited purchases of shelf-stable juices to cans; California required purchase of 64-ounce bottles, and Connecticut required cans for all juices except orange juice, which had to be purchased in carton form.

For Connecticut and Oklahoma, the restrictions yielded similar savings: $1.76 PPM in Connecticut and $1.68 in Oklahoma. The estimated savings in Texas were considerably higher at $4.19 PPM. These large savings were the result of the State using several types of restrictions on juice in combination: a least expensive brand policy; limits on the types of juice that could be purchased; and a prohibition on the purchase of 46-ounce plastic bottles, which are more expensive than cans.

The savings from juice restrictions in California are estimated as $0.83 PPM. A different estimation approach, however, had to be used in California. North Carolina and Ohio (the unrestricted States) allowed purchase of either 46-ounce cans or 46-ounce plastic containers of juice, and scanner data revealed a strong preference in these States for plastic containers. Few of the sampled stores in California carried 46-ounce plastic containers of juice, so the counterfactual purchase could not be priced in California stores. Instead, the savings in California are based on a "reverse counterfactual" estimation approach. This approach estimated costs for juice in North Carolina and Ohio by imposing California juice restrictions on allowed types and packaging. These costs were then subtracted from estimated actual costs in the two States to estimate savings related to these restrictions (that is, the savings that would accrue in North Carolina and Ohio if they adopted California's restrictions on juice). These estimated savings averaged $0.83 PPM, and they serve as the estimated savings for California.

Infant Juice

Ohio and Oklahoma were the only two States in the study that prescribed infant juice. The other States prescribed single-strength adult juices to save money. Substitution of single-strength for infant juice yielded estimated savings in California and Texas of $0.20 PPM and $0.28 PPM, respectively. In Connecticut and North Carolina, however, juice costs **increased** by $0.26 PPM and $0.08 PPM, respectively. By requiring 46-ounce adult juice containers instead of 32-ounce infant juice containers, these two States paid slightly higher costs, but they distributed more juice. Variations across markets in the relative costs of single-strength and infant juices, and in allowable containers for single-strength juice, account for the differences in estimated savings for the four States.

Estimates of State Savings

By design, the estimates of food cost savings presented above and in table 4-3 do not account for variation among the States in food package tailoring and the distribution of participants across WIC certification categories. For those who desire State-level estimates that are closer to the actual savings arising from food-item restrictions (but less comparable among States), table 4-4 presents

[27] Federal regulations specify juice prescriptions in multiples of 46 ounces.

estimated food cost savings based on actual distributions of food packages and certification categories in each State.

The figures in table 4-4 also incorporate State estimates of savings discussed in earlier sections, but not incorporated in table 4-3 because they were not based on a standardized distribution of food packages. Specifically, table 4-4 includes California's estimate of savings from milk package restrictions of $0.38 PPM and Oklahoma's estimate of savings from its least expensive brand policy for milk of $0.57 PPM (which is added to a savings estimate of $0.05 PPM for its restrictions on container size). Because Connecticut and Texas also had least expensive brand policies for milk for which savings could not be estimated, the Oklahoma estimate of milk savings of $0.57 PPM is used for Connecticut and Texas as well.

Table 4-4—Estimated food cost savings per participant month, based on actual food packages prescribed and actual distribution of participants among certification categories

	CA	CT	NC	OH	OK	TX
			Dollars			
Milk[a]	0.38	0.57	0.57	0.05	0.62	0.57
Eggs[b]	0.16	0.26			0.31	0.10
Cheese	0.12	1.04			1.14	
Cereal	0.95				2.72	2.00
Infant cereal[c]	0.32	0.37				0.27
Juice	0.63[d]	1.69			1.60	4.16
Infant juice	0.10	–0.39	–0.06			0.22
Legumes		0.10			0.03	
Total	2.66	3.65	0.51	0.05	6.43	7.33

a Total savings for milk in Connecticut, North Carolina, Oklahoma, and Texas include an estimate of savings by Oklahoma officials of $0.57 PPM for their least expensive brand policy. The California saving of $0.38 PPM is based on information provided by State officials.

b Total savings for eggs in Connecticut and Oklahoma include an estimate of savings by Oklahoma officials of $0.19 PPM for their least expensive brand policy.

c Savings estimates include effects of manufacturer's rebates in California, Connecticut, and Texas.

d Estimated as a "reverse counterfactual" because sampled stores from California did not stock 46-ounce plastic containers of juice, which was a commonly purchased container in the unrestricted States of North Carolina and Ohio.

Blank cells in the table represent States whose participant preferences were used to estimate savings in States with restrictions.

Savings by food category may not sum to total because of rounding.

In addition, Oklahoma officials estimated savings equal to $0.19 PPM from their least expensive brand policy for eggs. This saving has been added to estimated savings of $0.12 PPM from the State's restrictions on allowed egg size, yielding a total saving of $0.31 PPM for eggs. Lacking any other empirical estimate of savings from Connecticut's least expensive brand policy for eggs, the table entry of $0.26 for eggs in Connecticut includes the Oklahoma estimate of $0.19 PPM. The remaining $0.07 PPM is the evaluation's estimate for savings attributable to Connecticut's size restrictions on eggs.

Therefore, the estimated savings in table 4-4 for milk and eggs (and for total savings) represent a mixture of evaluation and State official's estimates of savings from food-item restrictions. Although the estimates provided by State officials could not be verified, they provide information that the evaluation could not provide because of data limitations.[28]

With the combination of State and evaluation estimates of savings in table 4-4, total savings from food-item restrictions ranged from a low of $0.05 PPM in Ohio to a high of $7.33 PPM in Texas. In both tables 4-3 and 4-4, Ohio had small estimates of total savings, and North Carolina had either a small loss or a modest saving. The finding of small effects in these two States is not surprising. North Carolina and Ohio were selected to represent States with few food-item restrictions, so cost savings due to such restrictions were not expected.

Of the four States with large estimated savings from their food-item restrictions, Texas had the largest—$6.82 PPM in table 4-3 and $7.33 PPM in table 4-4. The largest contributors to these savings were the State's large minimum package size requirements for cereal and its combined juice policies of least expensive brand and limited types and containers.

With estimated savings of $6.14 PPM (table 4-3) and $6.43 PPM (table 4-4), Oklahoma had the second highest estimated savings within the six States. One of the reasons for selecting Oklahoma was to examine the consequences of its requirement that only store-brand or private-label cereals could be purchased with WIC food instruments. This restriction led to estimated savings of $2.82 PPM (table 4-3) and $2.72 PPM (table 4-4). Other major contributors to Oklahoma's total savings were its least expensive brand policy for cheese and its requirement that juice purchases be limited to store or private-label brands.

Total food package cost savings in Connecticut are estimated as $3.09 PPM (table 4-3) and $3.65 PPM (table 4-4). The largest contributions to these savings came from the State's least expensive brand restrictions on cheese and juice. Finally, the estimated savings for California ($2.48 PPM in table 4-3 and $2.66 PPM in table 4-4) arose largely from its restrictions on the number and types of cereal that may be purchased and on its package size restrictions on juice.

The estimated savings per participant per month in table 4-4 represent substantial reductions in average food package costs, both in percentage terms and as annualized savings. Table 4-5 presents the estimated reductions. On a percentage basis, Oklahoma and Texas experienced the largest estimated reductions in food package costs: 21.0 and 21.4 percent, respectively. California and Texas had the greatest annualized savings, $39.7 and $66.0 million, respectively, due to the combination of their large WIC caseloads and large savings per participant per month.

The **annualized** savings presented in table 4-5 are not the same as **annual** savings; the estimates in the table are based on WIC price and transaction data collected at a point in time, not over the course of a full year.

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[28] California officials' estimate of $0.63 PPM in savings due to use of maximum price restrictions on milk are not included because savings from maximum value restrictions on food instruments in the other States are not available.

Table 4-5—Estimates of food package savings

	CA	CT	NC	OH	OK	TX
Savings PPM	$2.66	$3.65	$0.51	$0.05	$6.43	$7.33
Savings (percent)	6.9	9.4	1.9	0.2	21.0	21.4
Caseload (000s)	1,243	49	200	247	87	750
Savings (millions)	$39.7	$2.2	$1.2	$0.1	$6.7	$66.0

In estimating food package savings on a percentage basis, estimated savings were divided by the sum of estimated savings plus estimated actual food package costs.

Finally, in reviewing these estimates of food package savings, it is important to remember that the savings estimates are based on a number of simplifying assumptions. Furthermore, they are not representative of the effects of food-item restrictions nationally. The six States do not represent a random sample. Instead, they were selected to represent a mixture of vendor and food-item restrictions designed to reduce food package costs. Therefore, the focus of the analysis has been relating specific food-item restrictions to their associated effects on food costs. From the analysis, it is clear that all three major types of food-item restrictions (least expensive brands, limited choice of types, and package-size restrictions), as well as manufacturer rebates, were able to achieve cost savings.