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Manufacturers' Bids for WIC Infant Formula Rebate Contracts, 2003-2013

David E. Davis and Victor Oliveira

United States Department of Agriculture

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Abstract

The U.S. Department of Agriculture's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is the major purchaser of infant formula in the United States, and its mandatory rebate program saved WIC $1.9 billion in FY 2013. WIC State agencies are required by law to have competitively bid infant formula rebate contracts with infant formula manufacturers. Contracts are awarded to the manufacturer offering the WIC State agency the lowest net price (as determined by the manufacturer's wholesale price minus the rebate). This study examines both the winning and losing bids from the infant formula manufacturers for State agency contracts awarded from 2003 to 2013. Only three infant formula manufacturers bid on rebate contracts during this period, and bids varied greatly across the contracts. In general, there was a large disparity in the winning real net price bid and the next closest contender. Results from this study suggest that infant formula manufacturers aggressively compete for WIC contracts. In recent years, rebates have been large (over 90 percent of the wholesale price), every contract has received multiple bids, and contracts have turned over regularly among firms.

Keywords: Special Supplemental Nutrition Program for Women, Infants, and Children, WIC, net price, rebates, bids

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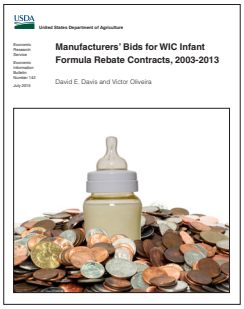
United States Department of Agriculture

A report summary from the Economic Research Service July 2015



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Manufacturers' Bids for WIC Infant Formula Rebate Contracts, 2003-2013

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What Is the Issue?

The U.S. Department of Agriculture's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) is a discretionary grant program funded annually by appropriations law—consequently, the number of participants who can be served within its fixed budget depends heavily on the program's food-package costs. WIC is the major purchaser of infant formula in the United States. To reduce costs, WIC State agencies are required to operate a cost-containment system for procuring infant formula. Typically, WIC State agencies obtain substantial rebates from infant formula manufacturers for each can of formula purchased through the program, and in return, the manufacturer gets an exclusive contract to provide its infant formula to WIC participants in the State. Contracts (which usually last about 4 years) are competitively awarded to the manufacturer offering the lowest net price (wholesale price minus the rebate). Some State agencies have formed multi-State alliances to jointly request net price bids.

The infant formula rebate program has been successful at reducing costs—rebates totaled $1.9 billion in FY 2013. Net price bids vary across WIC State agencies, as well as for a given State agency over time, and not much is known about the reasons for this variation. Given the importance of infant formula rebates to the WIC program, it is important to understand the factors and patterns associated with the net price bids offered by infant formula manufacturers. This report documents and analyzes both the winning and losing net price bids offered by manufacturers seeking infant formula contracts with WIC agencies.

What Did the Study Find?

Results of this study indicate that the bidding for WIC infant formula rebate contracts is highly competitive.

Key findings include:

- The infant formula market is highly concentrated, with three firms (Abbott, Mead Johnson, and Nestlé/Gerber) accounting for the vast majority of all formula sales. During the 2003-13 study period, only these three infant formula manufacturers bid on rebate contracts, and each of them submitted bids for most of the contracts awarded.
- Each manufacturer's net price bids varied greatly across the contracts. For example, Mead Johnson's bids ranged from $0.16 to $2.28 per 26 fluid ounces of reconstituted formula; Abbot's bids ranged from $0.13 to $4.14; and Nestlé/Gerber's bids ranged from $0.07 to

$1.37 (in 2013 dollars). Furthermore, bids varied widely between the firms for a particular State's contract, suggesting that each manufacturer values the contracts differently than the other manufacturers.

- Regression analyses indicate that larger States/alliances generally get slightly lower net price bids than smaller States/alliances.
- Among all three manufacturers, winning net price bids increased until about 2007. The decrease in winning net prices observed since about 2008 may have been due, at least in part, to a decline in the total sales of infant formula. In the face of a shrinking market for their product, manufacturers may compete more aggressively for WIC contracts to maintain their sales volume.
- Holding a contract did not guarantee that a manufacturer would win that State/alliance's contract the next time it came up for bid, although it did increase the likelihood. Of the 55 contracts awarded during the study period, only 21 (or 38 percent) changed from one contract holder to another.
- There is a large disparity in the winning net price bid and the next closest bid in many States. Between 2003 and 2013, the average second-lowest net price bid was 1.8 times larger than the winning bid; however, the margins have narrowed since 2008. Prior to 2008, the average second-lowest net price bid was 2.0 times the winning bid, and from 2008-13, it was 1.6 times the winning bid. Many of the larger margins of victory before 2008 occurred when only two firms submitted bids.
- In recent years, every contract has received multiple bids, and contracts turn over regularly among firms (i.e., 38 percent of the time). Rebates are large (e.g., among contracts in effect in February 2013, rebates averaged 92 percent of the wholesale price).

How Was the Study Conducted?

This report examines the net price bids submitted to WIC State agencies by infant formula manufacturers between 2003 and early 2013. The study focused on the predominant type of infant formula used in the WIC Program: milk-based powdered infant formula supplemented with the fatty acids docosahexaenoic acid (DHA) and arachidonic acid (ARA). Net prices were converted to a standard unit—26 fluid ounces of reconstituted infant formula—and were adjusted for inflation to constant 2013 dollars using the Consumer Price Index for All Products. The information on contracts offered for bid and the net price bids received was used to document bidding patterns for each manufacturer.

Manufacturers' Bids for WIC Infant Formula Rebate Contracts, 2003-2013

Introduction

The U.S. Department of Agriculture's (USDA) Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides supplemental foods, nutrition education, and referrals for health care and other social services to nutritionally at-risk low-income pregnant, post-partum, and breastfeeding women, infants, and children under age 5. Approximately half of all infants born in the United States participate in WIC. Although WIC recognizes and promotes breastfeeding as the optimal source of nutrition for infants, the program provides iron-fortified infant formula for infants who are not fully breastfed.[1] WIC is the major purchaser of infant formula: the USDA's Economic Research Service (ERS) estimated that between 57 and 68 percent of all infant formula sold in the United States between 2004 and 2006 was purchased with WIC benefits (Oliveira et al., 2010). Because of the large volume of formula purchased through the program, even small increases in per-can formula costs can result in large increases in total costs to WIC.[2]

As USDA's largest discretionary program, WIC is funded annually by congressional appropriations, which may not be sufficient to fund every eligible applicant. To reduce costs and extend available funds, WIC State agencies are required by law to operate a cost-containment system for the purchase of infant formula.[3] Most State agencies offer an exclusive marketing right to infant formula manufacturers in exchange for a per-can rebate on each unit sold through WIC. Manufacturers compete to be a State agency's sole supplier by offering rebates as sealed bids in an auction-like format.[4] The manufacturer that offers the lowest net price (defined as the wholesale price minus the rebate) becomes a State agency's sole supplier of infant formula.[5] As a result, the brand of formula provided by WIC varies by State, depending on which manufacturer holds the contract.

[1]Historically, WIC infants breastfeed at a lower rate than non-WIC infants (Centers for Disease Control and Prevention, 2010).

[2]Although infant formula is now available in a variety of containers including cans, tubs, cartons, pouches, and bottles, for simplicity, we use "can" throughout this report to describe all infant formula containers.

[3]In the 1980s, infant formula accounted for a large and increasing share of total WIC food costs. To control costs, Tennessee and Oregon implemented rebate programs in 1987, and other States soon followed. As a result of the cost savings realized from those rebate programs, P.L. 101-147 was enacted in 1989 requiring State WIC agencies to use competitive bidding (or an alternative method that would yield savings equal to or greater than those produced by competitive bidding) to procure infant formula. At that time, WIC was not fully funded—that is, appropriated funds were not sufficient to serve all eligible applicants who wanted to participate, and infant formula rebates helped the program maximize the number of people who could participate.

[4]See Oliveira and Davis (2006) for a detailed description of how rebate contracts work.

[5]WIC State agencies are allowed to issue noncontract formula that meets the Federal WIC minimum requirements and specifications to WIC participants only with medical documentation of the qualifying condition. Other exceptions include: (1) exempt formulas (i.e., formulas for use by infants who have inborn errors of metabolism or low birth weight, or who otherwise have unusual medical or dietary problems) are not part of rebate contracts, and (2) under some circumstances, contracts for milk-based infant formula and soy-based infant formula within a State/alliance can be held by different manufacturers. All State agencies allow for exempt infant formula and WIC-eligible nutritionals to be issued (with medical documentation) for a qualifying condition that requires the use of a WIC formula.

The rebate program has been successful at reducing costs, thus allowing WIC to provide benefits to more eligible participants.[6] The rebates realized by WIC are large. For example, among contracts in effect in February 2013, rebates averaged 92 percent of the wholesale price—i.e., WIC paid only 8 percent of the wholesale price of infant formula on average (Oliveira et al., 2013) (see box, "The Retail Markup of Infant Formula and WIC"). Rebates totaled $1.9 billion and supported about 23 percent of all participants in FY 2013 (fig. 1).

Typically, each WIC State agency requests rebate bids from the infant formula manufacturers. In some instances, State agencies have formed multi-State alliances and jointly request rebate bids. In these cases, each WIC State agency in the alliance receives the same rebate and pays the same net price. The process of individual States/alliances conducting separate rebate auctions results in States/alliances paying different net prices. Besides this net price variation across different States/alliances, there can be substantial net price variation for a given State/alliance over time as it negotiates new contracts. When a State/alliance determines its provider of infant formula, the State/alliance and the manufacturer enter into an exclusive-rights contract that typically lasts about 4 years (including extensions).[7] Contracts may be extended beyond their original term depending on the original contract's provisions (in some cases mutual consent is required and in some cases the State/alliance has the unilateral right to extend the contract).

Net prices are important to monitor because they—along with retail markups—are what WIC pays for infant formula. Although rebates are currently large, the costs to WIC could increase significantly if rebates were to decrease. Given the critical role of infant formula rebates to the WIC program, it is important to understand the factors and patterns associated with the net prices offered by the formula manufacturers. While net price bids vary across agencies and within agencies over time, little is known about why the bids vary. Patterns in bidding—both winning and losing bids—

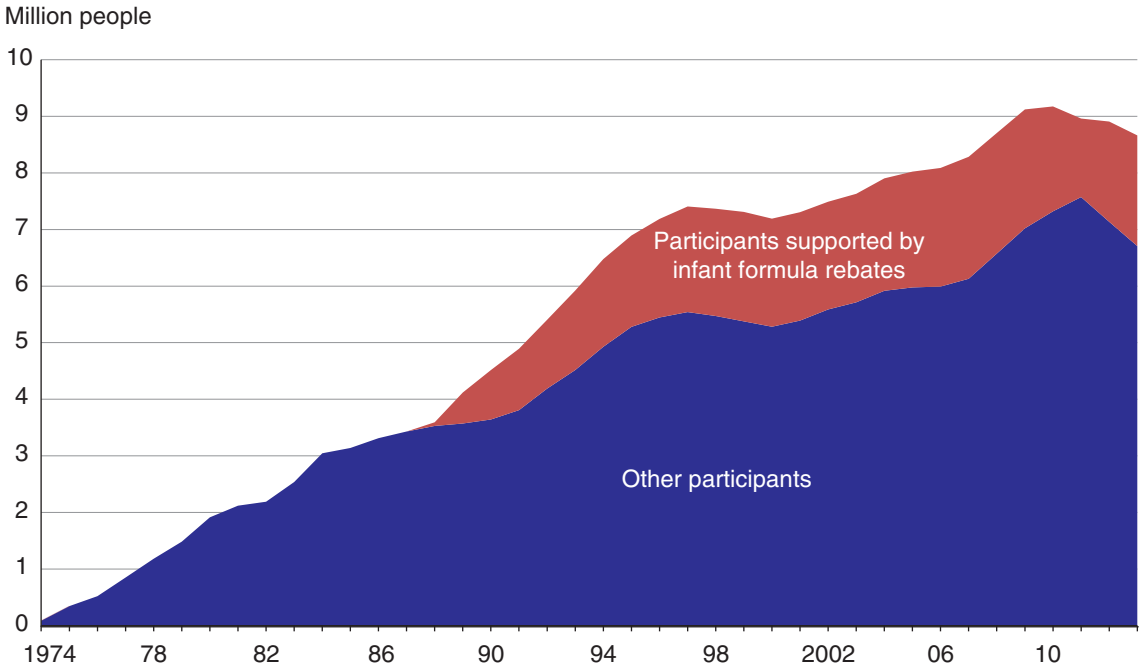
The Retail Markup of Infant Formula and WIC

Net price is only one component of what the U.S. Department of Agriculture's Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) pays for infant formula. Participants in all States except Vermont and Mississippi purchase infant formula from authorized retail vendors using a food instrument (i.e., voucher, check, or electronic benefits transfer (EBT) card) that specifies the brand and amount of formula that can be purchased. The WIC State agency then reimburses the vendor for the full retail price of the formula purchased by WIC participants and receives the rebates from the manufacturer holding the WIC contract. Thus, the final cost to WIC for a can of formula has two components: (1) net price and (2) retail markup. A previous study by the authors based on 2004 data found that, in most States, the retail markup—not the net price—was the largest component of infant formula costs to WIC (Oliveira and Davis, 2006). The relatively small net prices are a reflection of the effectiveness of the rebate program in lowering the cost of infant formula to WIC.

[6]In recent years, participation in WIC has leveled off, as appropriations for WIC have stabilized at what is believed to be near full-funding levels (Oliveira et al., 2002).

[7]The average length (including extensions) of contracts implemented after 2002 and completed prior to 2013 was 4.3 years. The contracts contain inflationary provisions so that, in the event of an increase/decrease in the wholesale price after the bid opening, there is a cent-for-cent increase/decrease in the rebate amounts. Thus, the nominal net price of formula to a WIC State agency remains fixed over the entire contract term despite increases (or decreases) in the wholesale price after the contract is initiated.

Figure 1
Average monthly number of WIC participants supported by rebates, FY 1974-2013



WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
Note: The number of WIC participants supported by infant formula rebates was calculated by multiplying the total number of WIC participants by rebates' share of total program expenditures and rebates.
Source: USDA, Economic Research Service calculations based on USDA, Food and Nutrition Service (2014b) estimates of number of participants; USDA, Food and Nutrition Service (2014a) estimates of infant formula rebates (FY 2009-13); and USDA, Food and Nutrition Service (2012) estimates of infant formula rebates (FY 1988-2008).

provide information about the bidding process. This report documents and analyzes the net price bids offered by infant formula manufacturers seeking infant formula contracts with WIC agencies between 2003 and early 2013 to illuminate some of the sources for, and implications of, intra- and interagency net price variation.

Infant Formula Market

The infant formula market is highly concentrated. In 2008 (the most recent year for which data are available), three manufacturers accounted for 98 percent of all dollar sales (Oliveira et al., 2011). Abbott Nutrition, maker of the Similac product line (43 percent), and Mead Johnson Nutrition, maker of the Enfamil line (40 percent), accounted for the majority of dollar sales, while Nestlé (now Gerber), maker of the Good Start Line, accounted for another 15 percent.[8]

Most infant formula is milk based (comprising some 80 percent of dollar sales in 2008), while soy-based infant formula accounted for 14 percent of all dollar sales and other infant formula bases (such as protein hydrolysate) accounted for the remaining 6 percent. Powder is the predominant product form for infant formula sold in the United States—in 2008, powder comprised 83 percent of all dollar sales, up from 71 percent in 2004. During the same period, sales of liquid concentrate fell from 20 percent to 10 percent of all infant formula sales, and ready-to-feed formula fell from 9 percent to 7 percent.

One of the most important developments in the infant formula market in the last several decades was the introduction of infant formulas supplemented with the fatty acids docosahexaenoic acid (DHA) and arachidonic acid (ARA), which some studies have linked to improved vision and cognitive development in infants. Abbott first introduced these infant formulas into its U.S. product lines in 2002, with Mead Johnson and Nestlé/Gerber following in 2003. Although substantially more expensive than unsupplemented infant formulas, sales of DHA/ARA-supplemented infant formulas increased rapidly, and by 2008, they accounted for nearly all—98 percent—dollar sales.

[8]Nestlé acquired Gerber in 2007, and in February 2010, the brand name of Nestlé's line of infant formulas was changed to Gerber.

Data

The data used in this analysis were compiled from a variety of sources. We focused on contracts for milk-based powdered infant formula supplemented with DHA/ARA—the predominant type of formula used in the WIC program—negotiated between 2003 and 2013. Fifty-five contracts fit this criteria.[9]

Each of the three major manufacturers offers a number of infant formula products. Furthermore, each of the infant formula manufacturers' product lines have changed over time as products are reformulated, additives are introduced, container sizes change, new formulas are launched, and others are discontinued. All analyses discussed in this report are based on the manufacturers' principal iron-fortified DHA/ARA-supplemented milk-based powder infant formula for routine feeding. They are:

Mead Johnson:

- Enfamil LIPIL (12.9 oz can) from 4/2003 to 7/2009
- Enfamil Premium Infant (12.5 oz can) starting in 8/2009

Abbott:

- Similac Advance (12.9 oz can) from 6/2002 to 5/2010
- Similac Advance (12.4 oz can) starting in 6/2010

Nestlé/Gerber:

- Good Start Supreme DHA/ARA (12 oz can) from 6/2003 to 4/2009
- Good Start Gentle Plus (12 oz can) from 5/2009 to 5/2011
- Good Start Gentle Plus (12.7 oz can) starting in 6/2011

To calculate net price, we subtracted each firm's rebate bid from its wholesale price for a truckload-size shipment of each of the infant formula products. Manufacturers offer rebates as bids in response to State agencies' requests. Federal statute requires that net price be evaluated using each manufacturer's lowest national wholesale price for a full truckload of the product on the date of the bid opening (Title 7 Federal Register 246 16a). Rebates and wholesale prices were collected from State agency bid sheets.[10] Because both the package sizes and the reconstitution factors for the various products differ, all rebates, wholesale prices, and net prices cited in this report were converted to a standard unit—26 fluid ounces of reconstituted formula—for comparison purposes. Rebates, whole-

[9]We did not include contracts offered by Colorado, Louisiana, New York, and Oklahoma in 2003 and Alabama in 2004 because bids were not based on docosahexanoic acid (DHA) and arachidonic acid (ARA) supplemented formulas. The analysis also excluded Mississippi and Vermont, which use different food-delivery systems to distribute infant formula, as well as all Indian Tribal Organizations.

[10]We compiled rebates and wholesale prices with assistance from USDA's Food and Nutrition Service and the Center on Budget and Policy Priorities.

sale prices, and net prices were also adjusted to constant 2013 dollars using the Consumer Price Index for All Items—the most widely used measure of general price changes.[11]

Data on the number of participating infants are from USDA's Food and Nutrition Service, the agency responsible for administering WIC. The number of participating WIC infants is the annual average of each State's monthly total number of participating infants; no adjustments were made for partial- or full-breastfeeding rates.[12] The number of participating infants in an alliance of State agencies is the sum of the annual monthly average number of participating infants in each of the State agencies in the alliance.

[11]We use the Consumer Price Index for All Items as the deflator since we are interested in estimating the real cost of formula to taxpayers. Therefore, the relevant comparison is the price of infant formula relative to the price of other consumer goods.

[12]Starting in FY 2010, all WIC State agencies began implementing revised food packages and reporting the number of participating infants that were issued fully or partially breastfeeding food packages. Our analysis uses the total number of participating infants in order to be consistent with the infant participation data available prior to FY 2010.

Submission of Bids by Manufacturers

During the 2003-13 study period, only the three major infant formula manufacturers—Abbott, Mead Johnson, and Nestlé/Gerber—bid on rebate contracts. Mead Johnson won 21 contracts, Nestlé/Gerber won 16, and Abbott won 18. Each of these three infant formula manufacturers submitted bids for most of the contracts awarded (table 1). Mead Johnson bid for all 55 contracts (100 percent), while Abbot offered a bid for 54 of the 55 contracts (98 percent). Nestlé/Gerber submitted bids for only 36 of the 55 contracts (65.5 percent); however, it started to bid on all contracts starting with the Pennsylvania contract that became effective in October 2008.

Figure 2 shows the real (i.e., inflation adjusted) net price bid by each firm for each contract during the study period. Three patterns stand out:

- Each manufacturer's bids varied greatly across the contracts. For example, Mead Johnson's lowest bid was $0.16, while its highest bid was $2.28, or over 14 times larger than the lowest bid. Abbot's lowest bid was $0.13, while its highest bid was $4.14 (over 31 times larger), and Nestlé/Gerber's lowest bid was $0.07, and its highest bid was $1.37 (almost 20 times larger). On average, Abbott's bids showed the most variation over the study period, followed by Mead Johnson. The standard deviation—a common measure of dispersion—of Abbott's bids was 0.74, compared with 0.44 for Mead Johnson and 0.22 for Nestlé/Gerber. These results suggest that the manufacturers value the contract for each State/alliance differently, which leads to variability in bids across agencies.

- For each contract, bids varied widely across manufacturers—that is, the firms did not bid similarly for each State/alliance contract. Examination of the correlation between the net prices bid by the manufacturers bears this out (table 2).[13] The correlations between the net prices bid by Mead Johnson and Abbot (0.20), and between Abbott and Nestlé/Gerber (-.07) were weak, indicating little relationship. There was also only a moderate relationship between the bids by Mead Johnson and Nestlé/Gerber (0.46). These results suggest that each manufacturer values the contracts differently from the other manufacturers.

- Occasionally, Abbott and, to a lesser degree, Mead Johnson submitted a bid for a contract that was out of line with the bids submitted by the other manufacturers. The data suggest that some bids may be submitted with no intention of winning the contract. For example, Abbott's bid for the Colorado contract in 2013 provided a rebate that was less than 1 percent of the wholesale price. The reason for extremely high net price bids is unknown, but anecdotal evidence suggests that it may be to express displeasure with some aspect of a particular contract.

[13]The correlation coefficient measures the strength and direction of the linear relationship between two variables. A value of 1 signifies a perfect positive fit—i.e., as one variable increases (decreases), the other variable increases (decreases) to the same degree; zero indicates no relationship between the variables. A negative value indicates a negative relationship between the variables—i.e., as one increases, the other one decreases.

Table 1
Infant formula manufacturers' contracts

State/alliance	Effective month	Year	Mead Johnson	Abbott	Nestlé/Gerber
California	Aug	2003	HPC		
Arkansas, New Mexico, North Carolina	Oct	2003	HPC		
Indiana	Oct	2003	HPC		
Missouri, Nebraska, South Dakota	Oct	2003	HPC		
Pennsylvania	Oct	2003		HPC	
Tennessee	July	2004		HPC	
Louisiana	Oct	2004		HPC	
New Jersey	Oct	2004			HPC
South Carolina	Apr	2005		HPC	
North Dakota	July	2005			HPC
Oklahoma	Oct	2005			HPC
Wisconsin	Jan	2006		HPC	
Kentucky	July	2006			HPC
New York	July	2006	HPC		
Virginia	July	2006			HPC
Arkansas, New Mexico, North Carolina	Oct	2006	HPC		
Georgia	Oct	2006	HPC		
NEATO	Oct	2006	HPC		
Ohio	Oct	2006		HPC	
Michigan	Nov	2006		HPC	
Colorado	Jan	2007		HPC	
California	Aug	2007		HPC	
Alabama	Oct	2007		HPC	
Indiana	Oct	2007	HPC		
Louisiana	Oct	2007		HPC	
New Jersey	Oct	2007		HPC	
Texas, Iowa, Minnesota	Oct	2007	HPC		
WSCA	Oct	2007	HPC		
Florida	Feb	2008			HPC
Illinois	Feb	2008		HPC	
Pennsylvania	Oct	2008		HPC	
Oklahoma	Oct	2008			HPC
Tennessee	July	2009			HPC
Arkansas, New Mexico, North Carolina	Oct	2009	HPC		
Missouri, Nebraska, South Dakota	Oct	2009	HPC		
North Dakota	July	2009			HPC
South Carolina	Apr	2010			HPC
Georgia	Oct	2010		HPC	
Wisconsin	Jan	2011			HPC

Continued—

Table 1
Infant formula manufacturers' contracts—continued

State/alliance	Effective month	Year	Mead Johnson	Abbott	Nestlé/Gerber
New York	July	2011	HPC		
Virginia	July	2011		HPC	
Kentucky	July	2011			HPC
Indiana	Oct	2011	HPC		
NEATO	Oct	2011			HPC
Ohio	Oct	2011		HPC	
Michigan	Nov	2011	HPC		
California	Aug	2012	HPC		
Arkansas, New Mexico, North Carolina	Oct	2012	HPC		
Alabama	Oct	2012		HPC	
Louisiana	Oct	2012	HPC		
New Jersey	Oct	2012		HPC	
Texas, Iowa, Minnesota	Oct	2012		HPC	
WSCA	Oct	2012		HPC	
Colorado	Jan	2013	HPC		
Illinois	Jan	2013	HPC		

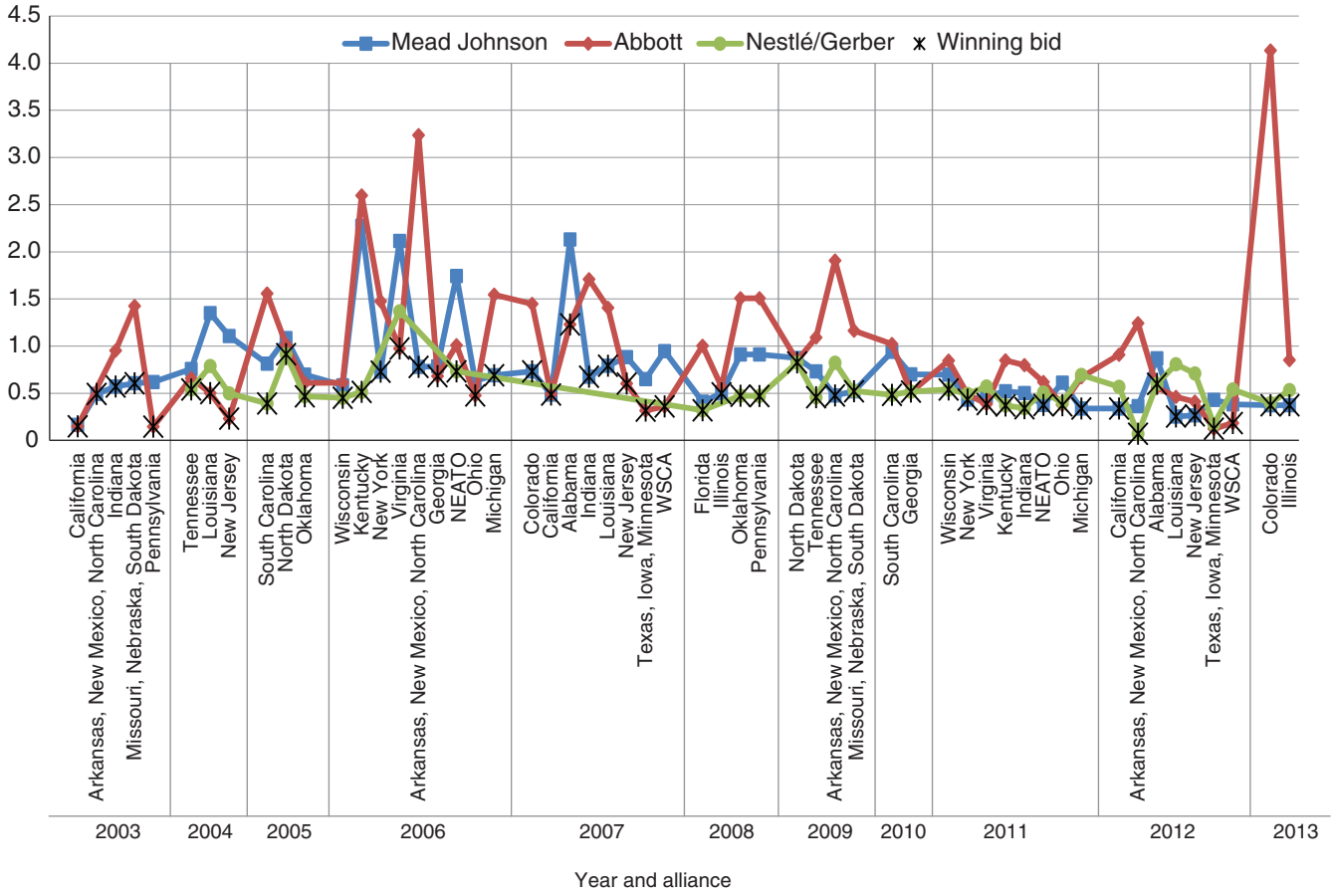
Notes: The Western States Contracting Alliance (WSCA) is comprised of 14 States: Alaska, Arizona, Delaware, Hawaii, Idaho, Kansas, Maryland, Montana, Nevada, Oregon, Utah, Washington, West Virginia, and Wyoming, and the District of Columbia. The New England and Tribal Organization (NEATO) is comprised of five States: Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island.

Source: USDA, Economic Research Service calculations based on data on infant formula manufacturers' net price bids from USDA, Food and Nutrition Service (various years) and the Center on Budget and Policy Priorities (2008).

Key			= Winning bidder
			= Non-winning bidder
			= Did not bid
		HPC	= Held previous State/alliance's contract

Figure 2
Net price bids, 2003-13

26 oz reconstituted milk-based powder (2013 dollars)



Notes: The Western States Contracting Alliance (WSCA) is comprised of 14 States: Alaska, Arizona, Delaware, Hawaii, Idaho, Kansas, Maryland, Montana, Nevada, Oregon, Utah, Washington, West Virginia, and Wyoming, and the District of Columbia. The New England and Tribal Organization (NEATO) is comprised of five States: Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island.
Source: USDA, Economic Research Service calculations based on data on infant formula manufacturers' net price bids from USDA, Food and Nutrition Service (various years) and the Center on Budget and Policy Priorities (2008).

Table 2
Correlation in net price bids among manufacturers, 2003-13

	Correlation coefficient
Mead Johnson and Abbott	0.202
Mead Johnson and Nestlé/Gerber	0.462
Abbott and Nestlé/Gerber	-0.069

Source: USDA, Economic Research Service calculations based on data on infant formula manufacturers' net price bids from USDA, Food and Nutrition Service (various years) and the Center on Budget and Policy Priorities (2008).

Do Larger States/Alliances Receive Lower Net Price Bids?

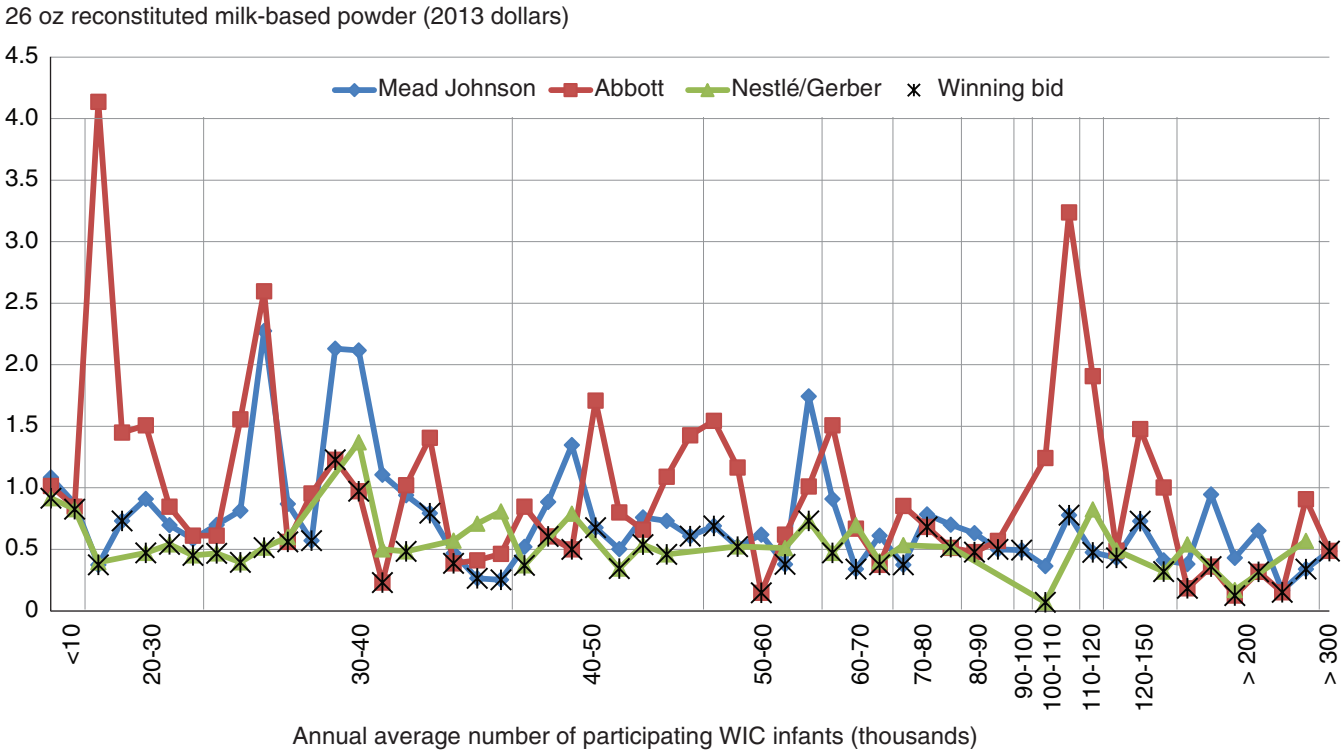
Figure 3 plots net price bids against the average annual number of participating WIC infants under each contract (see appendix C for State/alliance average annual infant participation levels for the year of the award).[14] There appears to be a negative relationship between State/alliance size and net price bid—i.e., larger States/alliances usually get slightly lower bids than smaller States/alliances.

We investigated this relationship further by conducting a linear regression analysis. (Regression analysis quantifies relationships between variables. A linear regression analysis is a statistical method that estimates an equation that assumes there is a linear relationship between variables.) We estimated the following equation,

$$Net\ Price_i = \alpha + \beta\ Infant\ Participation_i, \text{ where:}$$

Net Price is the dependent variable,

Figure 3
Net price bids and number of WIC infants in State/alliance, 2003-13



Note: For ease of display and interpretation, the horizontal axis displays discrete intervals between each State/alliance's set of bids; otherwise, within a category, some States/alliances with nearly equal numbers of WIC infants would have overlapping data points. Within categories, bids are ordered by number of infants. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
Source: USDA, Economic Research Service calculations based on data on infant formula manufacturers' net price bids from USDA, Food and Nutrition Service (various years) and the Center on Budget and Policy Priorities (2008), and data on number of WIC infants from USDA, Food and Nutrition Service (2014a).

[14]We use total infant participation without an adjustment for breastfeeding rates because there is not a consistent time series of breastfeeding data that cover the full time period we examine.

Infant Participation is the independent variable representing the number of WIC infants (measured in 10,000s) in the State/alliance,[15]

α is the y-axis intercept, and

β is the slope of the line.

We estimated three separate regression equations, one for each firm (see appendix A for a summary of the regression statistics). The first, for Mead Johnson, provided the following estimated equation:

$$\textit{Net Price} = 0.88 - .017\ \textit{Infant Participation}$$
$$(.083)\ (0.007)$$[16]

The slope is -.017, which implies that each increase in State/alliance size by 10,000 infants is associated with a decrease in net price bid of $0.017, or 1.7 cents per 26 ounces of reconstituted infant formula.

The regression equation for Abbott generated the estimated equation,

$$\textit{Net Price} = 1.19 - .026\ \textit{Infant Participation}$$
$$(0.14)\ (0.012)$$

Interpreting the slope coefficient, an increase by 10,000 in infants is associated with a decrease in net price bid of $0.026.

The final estimated regression equation, for Nestlé/Gerber, is

$$\textit{Net Price} = 0.614 - .009\ \textit{Infant Participation}$$
$$(.053)\ (.006)$$

This implies that each increase in State/alliance size by 10,000 infants is associated with a decrease in net price bid of $0.009. Although the estimates in the Abbott and Mead Johnson equations are statistically significant at the 95-percent confidence level, the response in the Nestlé/Gerber equation is not statistically different from zero.[17,18]

The next question is whether larger States/alliances ultimately receive lower winning bids. Figure 4 shows winning net prices sorted by the size of the State/alliance. Once again, there appears to be a

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[15]Ideally, the independent variable would represent the number of formula-fed WIC infants in the State/alliance. However, because information on the number of formula-fed infants is not available for the early years of the study period, we used number of WIC infants.

[16]The number in parentheses is the standard error.

[17]We experimented with other measures of agency size under the presumption that the number of non-WIC infants in a State/alliance may also affect bids. For example, we also used the number of WIC infants relative to the number of births (Ratio 1), and the number of WIC infants relative to the number of non-WIC infants (Ratio 2) as the independent variable. When Ratio 1 or Ratio 2 was used in place of *Infant Participation,* estimates of β were negative, but not statistically different from zero. We present results using *WIC Infant Participation* because it measures size and is a likely determinant of bids. Including non-WIC infants or births as additional independent variables may have introduced multicollinearity into the model as those measures are highly correlated with WIC participation.

[18]In regression analysis, the standard threshold for concluding an estimate is not zero is that a 95-percent confidence interval around the estimate does not include zero. For Nestlé/Gerber's estimate, the 95-percent confidence interval ranges from -0.02 to 0.002, which includes zero. Thus, we cannot conclude that the slope is truly different from zero.

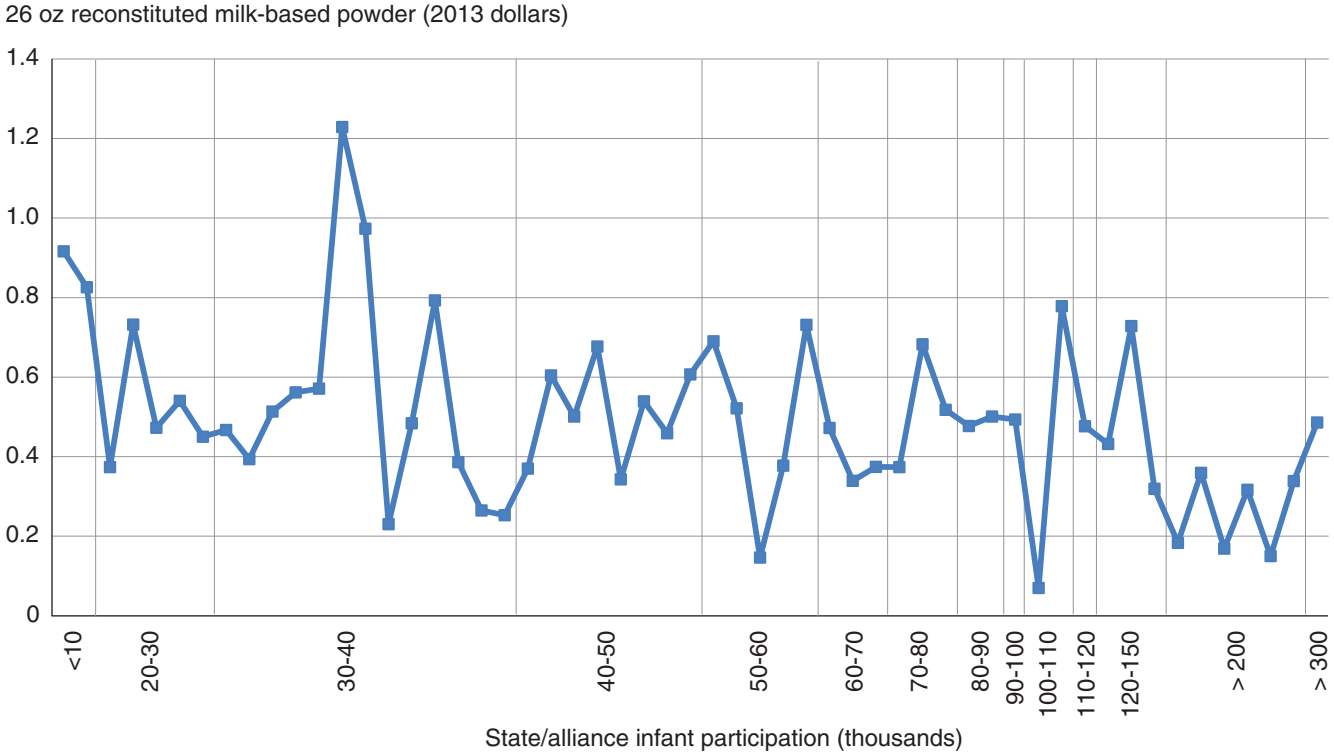
negative relationship between winning net price and State/alliance size. We evaluated the relationship using a linear regression analysis, which gave an estimated equation as:

$$\textit{Net Price} = 0.582 - .011\ \textit{Infant Participation}$$
$$(.039)\ \ (.003)$$

The coefficient on *Infant Participation* suggests that an increase in participation of 10,000 infants is associated with a $.01 decrease in winning net price.[19]

Thus, although we cannot definitively conclude that there is a relationship between State/alliance size and the net prices bid by Nestlé/Gerber, findings suggest that larger States/alliances may receive lower net price bids from Mead Johnson and Abbott. Furthermore, lower bids seem to translate into lower winning net prices for larger States/alliances. In 2004, Congress placed limits on the degree to which WIC State agencies could take advantage of this potential relationship by forming large

Figure 4
Winning net price bids by number of WIC infants in State/alliance, 2003-13



Note: For ease of display and interpretation, the horizontal axis displays discrete intervals between each State/alliance's set of bids; otherwise, within a category, some States/alliances with nearly equal numbers of WIC infants would have overlapping data points. Within categories, bids are ordered by number of infants. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
Source: USDA, Economic Research Service calculations based on data on infant formula manufacturers' net price bids from USDA, Food and Nutrion Service (various years) and the Center on Budget and Policy Priorities (2008), and data on number of WIC infants from USDA, Food and Nutrition Service (2014a).

[19]An econometric model that controls for factors other than agency/alliance size can be found in Davis (2014). The conclusions in that paper are consistent with the findings in this report; net price bids and agency/alliance size are inversely related.

multi-State alliances to receive lower net prices. Public Law 108-265 prohibited the formation of multi-State alliances if the total number of infants served by the States exceeds 100,000 (alliances with more than 100,000 infants as of October 2003 were exempt from this prohibition).[20] Any alliance in existence as of October 2003 may expand to serve more than 100,000 infants but may not expand to include any additional WIC State agencies, except if the WIC State agency to be added served fewer than 5,000 infants as of October 2003. This regulation grew out of concern that not all infant formula manufacturers would be able to compete for the larger multi-State contracts due to production capacity and/or distribution issues. The rationale was that it would help maintain competition among the infant formula manufacturers by helping to ensure that all manufacturers can compete for the rebate contracts (73 Federal Register 11308).

It is important to emphasize that this report only documents a regularity in the data and this relationship should not be interpreted causally. We cannot conclude from this evidence that increasing the size of a State/alliance will lead to lower net prices. There may be other factors related to State/alliance size that motivate firms to offer lower net prices and that are the true drivers for lower prices.[21]

[20]See appendix D for the number of infants participating in WIC by WIC State agency in FY 2013.

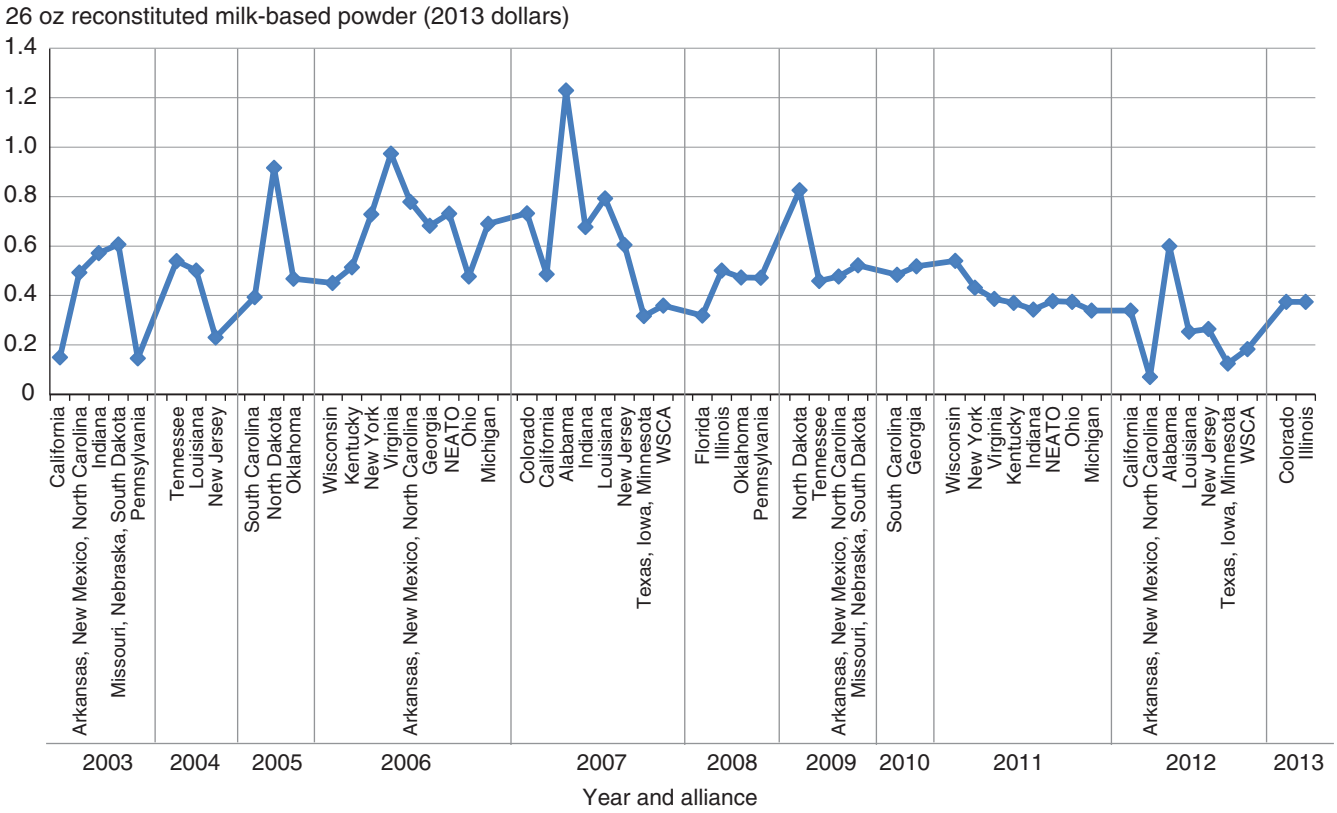
[21]This report focuses on net price bids that were based on docosahexaenoic acid (DHA) and arachidonic acid (ARA) supplemented formulas. Bids based on these products began in 2003, and we are interested in documenting bidding patterns since their inception and to date. The analysis ends in 2013 because those were the most recently available data at the time of this investigation. The short timeframe provides data from only 55 auctions and limits the type of hypotheses that we can investigate.

Trends in Winning Net Price Bids

Figure 5 shows all winning net price bids from 2003-13 for contracts in which all bids were based on supplemented formula, and two trends are apparent. Winning net price bids seem to be temporally increasing up to about 2007, but they decrease after 2007. These observations are consistent with the results of a study by Oliveira et al. (2013), which found that agencies paid higher net prices (when compared to their most recently negotiated previous contract) in the time period before 2008 but that relationship was reversed for contracts negotiated between 2008 and 2013.

Table 3 shows the changes in average bids (winning and losing bids) for each manufacturer when the 10-year time period between 2003 and 2013 is divided into two separate time periods: 2003-07 and 2008-13. The table reinforces the trends apparent in figure 5. Average bids for Mead Johnson declined $0.39 per 26 reconstituted ounces of formula in real terms between the two time periods. Abbot's bids decreased $0.09, and Nestlé/Gerber's bids decreased $0.16.

Figure 5
Winning net price bids, 2003-13



Notes: The Western States Contracting Alliance (WSCA) is comprised of 14 States: Alaska, Arizona, Delaware, Hawaii, Idaho, Kansas, Maryland, Montana, Nevada, Oregon, Utah, Washington, West Virginia, and Wyoming, and the District of Columbia. The New England and Tribal Organization (NEATO) is comprised of five States: Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island.
Source: USDA, Economic Research Service calculations based on data on infant formula manufacturers' net price bids from USDA, Food and Nutrition Service (various years) and the Center on Budget and Policy Priorities (2008).

Table 3
Average net price bids before and after 2008

	Before 2008	2008 and after	Change
Mead Johnson	0.92	0.54	-0.39
Abbott	1.02	0.93	-0.09
Nestlé/Gerber	0.67	0.51	-0.16

Source: USDA, Economic Research Service calculations based on data on infant formula manufacturers' net price bids from USDA, Food and Nutrition Service (various years) and the Center on Budget and Policy Priorities (2008).

Oliveira et al. (2013) suggested that a decrease in winning net prices in recent years may have been due, at least in part, to a decline in the demand for infant formula and lower total sales of infant formula resulting from:

1) A decline in the number of births in the United States;

2) An increase in breastfeeding rates; and

3) Revisions to the WIC food packages that were implemented in 2009 that, on average, reduced the amount of infant formula provided per infant.[22]

In the face of a shrinking market for their product, manufacturers may compete more aggressively for WIC contracts in order to maintain their sales volume.

[22]We did not examine these hypotheses within a regression framework because of the relatively short time series of net price observations for each cross sectional unit (agency/alliance).

Retaining a Contract

The analysis indicates that if a manufacturer held a State/alliance's prior contract, it was certain to bid for the State/alliance's next contract.[23] Mead Johnson was the prior holder of 21 of the 55 contracts, and it offered a bid for all 21 of those contracts (see table 1). In other words, conditional on holding the State/alliance's expiring contract, the probability that Mead Johnson offered a bid was 100 percent. Abbot was the prior holder of 21 of the contracts, and it submitted a bid for 21 of those contracts. Nestlé/Gerber was the prior holder for 13 of the contracts, and it submitted bids for all 13 of them.

While the manufacturers were certain to offer a bid for a contract when they were the holder of that State/alliance's prior contract, what was their likelihood of winning the bid? Were manufacturers more likely to win a contract if they were the previous winner? Of the 55 contracts awarded during the study period, 21 changed to a different contract holder. If each contract was treated as an independent statistical experiment, then the probability of a change in contract holder can be calculated as 21/55=0.38.[24] In other words, for every 3 contracts that are up for bid, on average only 1.14 of them would be won by a new manufacturer. However, if a contract's winner was determined at random from among the three potential manufacturers, then one would expect the probability of a change in contract holder to be 0.66 (i.e., one would expect 2 out of 3 contracts to change manufacturers). Thus, holding a contract does not guarantee that the same manufacturer will win the contract the next time, although once a manufacturer wins a contract, it is more likely than its competitors to win the next time the contract comes up for bid.

This was true for each manufacturer from 2003 to early 2013 (appendix B) and may reflect manufacturers' propensity to pursue contracts with the characteristics (e.g., size or geographic proximity) they value more than their rivals. Other factors resulting from winning previous contracts, such as established supply chains, good working relationships, and familiarity, may also play a role.

[23]This result is not surprising given that all three manufacturers bid on most contracts.

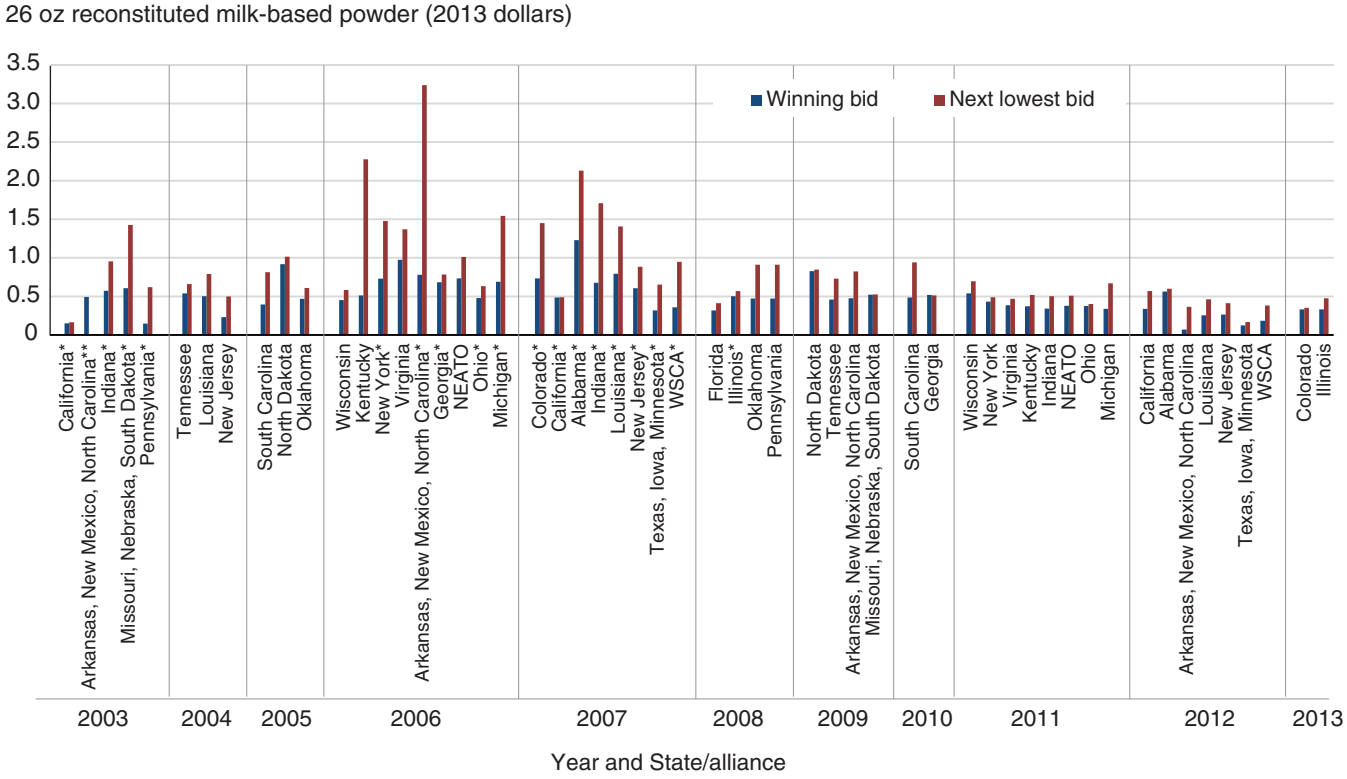
[24]An event that has more than one possible outcome, in which each possible outcome is known in advance, and for which the actual outcomes are uncertain can be considered a statistical experiment. WIC infant formula auctions meet these criteria, and so we can use the rules of probability to evaluate them.

Winning Bidders' Margin of Victory

In a number of cases, the real net price bid of the winning manufacturer (i.e., the lowest net price bidder) differed greatly from that of the next lowest bidder (i.e., the first runner up) (fig. 6). For example, in Pennsylvania in 2003, the second lowest net price bid was over 4 times larger than the winning bid, and in Arkansas/New Mexico/North Carolina in 2012, it was over 5 times greater. In total, in 13 instances, the second lowest net price bid was at least twice as large as the winning bid. On average, the second lowest net price bid was 1.8 times larger than the winning bid.[25] We refer to this difference in net price bid by winning manufacturer and the next lowest net price bid as the "margin of victory." Margins of victory are important because they indicate the impact on cost if the winning bidder for some reason did not bid on that contract and the first runner-up won the contract.

The margins of victory have declined in recent years, suggesting that the market has become more competitive. The average second lowest net price bid was 2.0 times the winning bid prior to 2008 and 1.6 times the winning bid from 2008 to 2013. Although the margins have narrowed, they

Figure 6
Winning net price bid and the next lowest net price bid, by State, 2003-13



** = 1 bidder, * = 2 bidders
Notes: The Western States Contracting Alliance (WSCA) is comprised of 14 States: Alaska, Arizona, Delaware, Hawaii, Idaho, Kansas, Maryland, Montana, Nevada, Oregon, Utah, Washington, West Virginia, and Wyoming, and the District of Columbia. The New England and Tribal Organization (NEATO) is comprised of five States: Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island.
Source: USDA, Economic Research Service calculations based on data on infant manufacturers' net price bids from USDA, Food and Nutrition Service (various years) and the Center on Budget and Policy Priorities (2008).

[25]Based on a simple average—i.e., each observation (contract) received the same weight, regardless of its size in terms of number of infants in the State/alliance receiving formula through WIC.

remain substantial in many cases.[26] It is interesting to note that many of the larger margins of victory that occurred prior to 2008 occurred when only two firms submitted bids. Based on simple averages, the second lowest net price was 1.7 times larger than the winning bid when there were 3 bidders, and 2.1 times the winning bid when there were only 2 bidders. Starting with the contracts for Pennsylvania and Oklahoma that became effective in 2008, each of the three manufacturers has bid on each contract.

[26]Real net prices, in general, have been decreasing since 2008 (see table 3).

Implications

In recent years, each of the three major infant formula manufacturers has submitted a bid every time a State/alliance WIC infant formula contract has come up for bid. Results of this analysis suggest that the manufacturers value many contracts differently (as measured by their net price bids). That is, for any given contract, net price bids vary widely among the three manufacturers and can also vary within a State/alliance over time for a given manufacturer. Despite these differences, the results of this study suggest no evidence of any anti-competitive contract-sharing scheme.[27] In recent years, every contract has received multiple bids, contracts turn over regularly among firms (about 38 percent of the time), and rebates are generally large (e.g., rebates averaged 92 percent of the wholesale price among contracts in effect in February 2013).

In many States, there is a large disparity in the net price bids between the manufacturer that won the contract (the lowest net price bid) and the next lowest bid (the bid of the first runner-up). In a previous study based on 1998-2006 data, we expressed concern that if bids by the losing manufacturers appear less aggressive as measured by relatively higher net prices, winning bidders could respond by submitting higher net bids on future contracts (Oliveira and Davis, 2006). Results from this analysis indicate that the margins between the winning bids and the next lowest net price bids have decreased since 2008, suggesting that the market for WIC infant formula contracts has become more competitive.

Although the difference between the lowest net price bid and the next lowest net price bid has narrowed since 2008, this gap is still substantial in some States/alliances. This finding suggests that it is important that the three manufacturers continue to bid on the contracts in order for the States to realize the lowest net prices.[28] Since the number of manufacturers that choose to bid is outside the control of WIC, having only three bidders leaves WIC vulnerable if one were to stop participating in the bidding process. Furthermore, the difference in the net price bid by the winning manufacturer and the net price bid by the runner-up reported here may underestimate the impact if one of the three manufacturers were to no longer bid on WIC contracts. This is because all three manufacturers were submitting bids for most contracts during most of the study period. However, if there were only two active bidders, their bids could become less competitive because they would know that they now only have to outbid one manufacturer to win the contract. The results of this analysis support the intent of the legislation (Public Law 108-265) that limited the formation of multi-State alliances in order to maintain competition by helping ensure that formula manufacturers can compete for multiple rebate contracts. [29]

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[27]In the early 1990s, concern was raised that coordination of pricing strategies between the infant formula manufacturers was leading to high infant formula prices and large profits for the manufacturers. In May 1990, the U.S. Senate Subcommittee on Antitrust, Monopolies, and Business Rights held a hearing on the pricing behavior of infant formula companies (U.S. Senate, 1990). In June 1992, the U.S. Federal Trade Commission (FTC) brought charges against the three largest domestic manufacturers of infant formula at that time—Abbott Laboratories, Mead Johnson, and American Home Products—alleging bid-rigging in connection with a WIC contract to provide infant formula in Puerto Rico (Federal Trade Commission, 1993). Mead Johnson and American Home Products agreed to settle charges by providing 3.6 million pounds of free infant formula to the WIC program but the court ruled in favor of Abbott Laboratories (853 Federal Supplement 526, May 27, 1994). The FTC has not brought any other price-related charges against the infant formula manufacturers since then.

[28]For example, of the 19 contracts awarded after 2009, each manufacturer won at least 5 contracts. So, if one of the manufacturers did not bid for WIC contracts during this period (and the bids of the two remaining manufacturers remained the same), the winning net price would be higher—and the costs to WIC would increase—in at least five of the contracts.

[29]In the spring of 2015, Mead Johnson, citing concern as to whether WIC was "on a sustainable path to continue serving" millions of participants, lobbied Congress to strengthen some of WIC's eligibility requirements (Tracy, 2015).

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Appendix A—Coefficients of Regression Models of WIC Infants in State/Alliance on Net Price, by Infant Formula Manufacturer, 2003-2013

Appendix table A1
Regression equations – All net price bids

Manufacturer	α (intercept)	Standard error for α	β *Infant Participation*	Standard error for β *Infant Participation*	R^2
Mead Johnson	0.877	(0.083)	-0.017	(0.007)	0.096
Abbot	1.189	(0.140)	-0.026	(0.012)	0.084
Nestlé/Gerber	0.614	(0.053)	-0.009	(0.006)	0.073

Source: USDA, Economic Research Service.

Appendix table A2
Regression equation – Winning net price

α (intercept)	Standard error for α	β *Infant Participation*	Standard error for β *Infant Participation*	R^2
0.582	(0.040)	-0.011	(0.003)	0.161

Source: USDA, Economic Research Service.

Appendix B. Probability of a Manufacturer Winning the Contract When It Held the Previous Contract

In this section, we examine the probability of a manufacturer winning the WIC infant formula contract conditional on it holding the previous contract. We show how to calculate the probability of an event, the probability of an event conditional on another event, and the joint probability of two events. These probabilities can be used to determine whether two events are independent. If two events are independent, then the occurrence of one event does not affect the likelihood of another event occurring. In this case, the events are winning a State/alliance's contract and winning a State/alliance's previous contract. We want to know whether holding a State/alliance's previous contract makes it more likely that the same manufacturer would win the State/alliance's next contract.

We treat each of the 55 contracts as independent statistical experiments, with each contract having one winner (actual outcome) from the three manufacturers (potential outcomes). We calculated the actual (unconditional) probability of each firm winning a contract. For example, Mead Johnson won 21 of the 55 contacts for a probability of winning the current contract, $P(MJ^{c)}$, equal to 21/55 = 0.382. Abbot won 16 of the 55 for a probability of winning the current contract, $P(A^c)$, of 16/55=0.291, and Nestlé/Gerber won 18 of the 55 for a probability of winning the current contract, $P(G^c)$, of 18/55 =.327.

We also calculated the probability that each firm held a State/alliance's expiring contract. Mead Johnson was the previous holder of 21 of the 55 contracts and P(MJP) = 21/55=0.382. Abbot previously held 21 contracts and $P(A^P) = 0.382$, and Nestlé/Gerber previously held 13 of the contracts and $P(G^P) = 0.236$.

With this information, we then calculated the probability that a firm wins the current contract *and* also held the same previous contract. Mead Johnson won the current contract and also held the previous contract 14 times. So the joint probability of winning the current contract and holding the previous contract is 14/55 = $P(MJ^c \cap MJ^P) = 0.255$.

We summarize the information in the joint probability tables in appendix table B1. A joint probability table summarizes the outcome of two statistical experiments. For our purposes here, the experiments are defined as "Won Current Contract" (on the vertical axis) and "Held Previous Contract" (on the horizontal axis). Each experiment has two mutually exclusive outcomes: yes or no. For example, Mead Johnson could have won the current contract (Yes) or not won the current contract (No), and it could have held the previous contract (Yes) or not held the previous contract (No).

The data are easily summarized in each firm's joint probability table. The figures at the end of the columns and rows are called marginal probabilities. We can see that $P(A^c) = 0.291$ is the marginal probability that Abbot won the current contract, and $P(A^P) = 0.382$ is the marginal probability that Mead Johnson previously held the contract.

The figures in the interior cells are the joint probabilities. We can see that the probability that Abbot won the current contract and held the contract previously is $P(A^c \cap A^p) = 0.182$. The joint probability that Abbot won the current contract and did not previously hold the State/alliance's contract, $P(A^c \cap A^{notp})$, equals 0.109. When summing either horizontally across rows, or vertically down columns, the interior cell entries sum to the marginal probabilities. For example, summing the two joint probabilities gives the marginal probability that Abbot won the current contract, $P(A^c \cap A^p) + P(A^c \cap A^{notp}) = P(A^c)$; 0.182 +0.109 = 0.291.

Appendix table B1

Joint probability tables for holding the current and previous contract for a State/alliance

Abbott				
		Held previous contract:		Marginal probability
		Yes	No	
Won current contract:	Yes	0.255	0.127	0.382
	No	0.127	0.491	0.618
Marginal probability		0.382	0.618	
Mead Johnson				
		Held previous contract:		Marginal probability
		Yes	No	
Won current contract:	Yes	0.182	0.109	0.291
	No	0.200	0.509	0.709
Marginal probability		0.382	0.618	
Nestlé/Gerber				
		Held previous contract:		Marginal probability
		Yes	No	
Won current contract:	Yes	0.182	0.145	0.327
	No	0.055	0.618	0.673
Marginal probability		0.236	0.764	

Source: USDA, Economic Research Service.

The joint probability tables are useful because they provide the necessary information to calculate conditional probabilities, and conditional probabilities can be used to test the independence of outcomes. A conditional probability restricts the event being analyzed to certain experimental outcomes. For example, a conditional probability could restrict our attention to the outcome of Mead Johnson winning the previous contract. So, we could calculate the probability that given (conditional) Mead Johnson held the previous contract, what is the probability they won the current contract, $P(MJ^c \mid MJ^p)$.[30] Conditional probabilities are calculated as the joint probability of the two outcomes divided by the probability of the restricted outcome. In this case, $P(MJ^c \mid MJ^p) = P(MJ^c \cap MJ^p) / P(MJ^p) = .255/.382 = 0.667$, since we are restricting our attention to cases in which Mead Johnson won the previous contract. Or, in other words, there is a 67-percent probability Mead Johnson would win a State/alliance's current contract, conditional on Mead Johnson holding the State/alliance's previous contract.

[30]In statistics, the vertical line indicates that the first outcome is conditioned on the second outcome. For example, $P(MJ^c \mid MJ^p)$ is read, "the probability of Mead Johnson winning the current contract, conditional on Mead Johnson holding the previous contract."

We can use these probabilities to test whether holding a State/alliance's current contract is independent from holding the State/alliance's prior contract. If two outcomes are independent, then one outcome does not depend on the occurrence or non-occurrence of another outcome and the outcomes are not related. A statistical test of the independence of the two outcomes is carried out by testing whether the probability of an outcome is affected by the occurrence of the other outcome. Here, we examine whether the probability of a manufacturer holding a State/alliance's current contract is the same whether or not the manufacturer held the State/alliance's previous contract.

The probability that Mead Johnson holds the current contract is $P(MJ^c) = 0.382$. On the other hand, the probability of Mead Johnson holding the current contract, conditional on holding the previous contract, is $P(MJ^c \mid MJ^p) = 0.667$. We see that the probability of Mead Johnson winning the current contract is affected by previously holding the contract, $P(MJ^c) = 0.382 \neq P(MJ^c \mid MJ^p) = 0.667$. This means that for Mead Johnson, winning a State/alliance's current contract is not independent from holding the State/alliance's previous contract; one outcome is dependent on the other outcome. In fact, when Mead Johnson holds a State/alliance's contract, it is more likely it will win the State/alliance's contract the next time it is up for bid.

We arrive at the same conclusion for both of the other firms based on the calculations of conditional probabilities summarized in appendix table B2. The probability that Abbott won a State/alliance's current contract, $P(A^c)$, equals 0.291. Meanwhile, the probability that Abbott won a State/alliance's current contract conditional on holding the State/alliance's previous contract is $P(A^c \mid A^p) = P(A^c \cap A^p) / P(A^p) = .182/382 = 0.476$. The probability of winning a current contract is higher conditional on Abbot having held the State/alliance's previous contract.

The calculations are similar for Nestlé/Gerber. The probability that Nestlé/Gerber won a State/alliance's current contract, $P(G^c)$, equals 0.327. Meanwhile, the probability that Nestlé/Gerber won an State/alliance's current contract conditional on holding the State/alliance's previous contract is $P(G^c \mid G^p) = P(G^c \cap G^p) / P(G^p) = 0.182/0.236 = 0.769$. The probability of winning a current contract increases when Nestlé/Gerber held the previous contract.

The conclusion from this analysis is that when we treat contracts from 2003 to early 2013 as the universe of contracts, firms are more likely to win a State/alliance's contract when they held the previous contract for that State/alliance. This conclusion may or may not apply to contracts bid in other time periods; our analysis applies only to the time period we examine. Likewise, we cannot say why firms are more likely to successfully bid for contracts that they previously held. Firms may bid differently for contracts based on size, geographic proximity, or other contract characteristics. If so, then the increase in winning probability may reflect a firm's propensity to pursue contracts with the characteristics they value more than their rivals.

Appendix table B2
Conditional probabilities

Manufacturer	Probability of winning a State/alliance's current contract conditional on holding its previous contract
Mead Johnson	0.667
Abbott	0.476
Nestlé/Gerber	0.769

Source: USDA, Economic Research Service.

Appendix C—Average Annual Infant Participation and Net Price Bids by Manufacturer

Appendix table C1

Year	State/alliance	Infants	Net price bids		
			Mead Johnson	Abbott	Nestlé/Gerber
2007	Alabama	36,287	2.13	1.23	
2012	Alabama	35,531	0.36	1.24	0.07
2003	Arkansas, New Mexico, North Carolina	94,584	0.49		
2006	Arkansas, New Mexico, North Carolina	103,840	0.78	3.24	
2009	Arkansas, New Mexico, North Carolina	110,662	0.48	1.91	0.82
2012	Arkansas, New Mexico, North Carolina	103,218	0.87	0.56	0.60
2003	California	286,725	0.16	0.15	
2007	California	317,808	0.49	0.49	
2012	California	289,565	0.34	0.91	0.57
2007	Colorado	24,758	0.73	1.45	
2013	Colorado	22,330	0.33	3.68	0.35
2008	Florida	122,942	0.41	1.00	0.32
2006	Georgia	75,332	0.78	0.68	
2010	Georgia	75,404	0.70	0.51	0.52
2008	Illinois	85,934	0.50	0.57	
2013	Illinois	74,138	0.33	0.76	0.48
2003	Indiana	35,915	0.57	0.95	
2007	Indiana	41,809	0.68	1.71	
2011	Indiana	42,253	0.50	0.80	0.34
2006	Kentucky	31,684	2.28	2.60	0.51
2011	Kentucky	40,217	0.52	0.85	0.37
2004	Louisiana	41,746	1.35	0.50	0.79
2007	Louisiana	37,810	0.79	1.41	
2012	Louisiana	38,643	0.25	0.46	0.81
2006	Michigan	54,200	0.69	1.54	
2011	Michigan	63,535	0.34	0.67	0.70
2003	Missouri, Nebraska, South Dakota	49,705	0.61	1.43	
2009	Missouri, Nebraska, South Dakota	56,662	0.52	1.16	0.52
2006	NEATO	57,731	1.74	1.01	0.73
2011	NEATO	56,712	0.38	0.62	0.51
2004	New Jersey	37,020	1.11	0.23	0.50
2007	New Jersey	40,261	0.88	0.60	
2012	New Jersey	38,524	0.26	0.41	0.71
2006	New York	121,368	0.73	1.48	
2011	New York	121,250	0.43	0.49	0.49
2005	North Dakota	3,334	1.08	1.01	0.92

Continued—

Appendix table C1—continued

Year	State/alliance	Infants	Net price bids		
			Mead Johnson	Abbott	Nestlé/Gerber
2009	North Dakota	3,337	0.87	0.85	0.83
2006	Ohio	85,294	0.63	0.48	
2011	Ohio	69,930	0.61	0.37	0.40
2005	Oklahoma	30,364	0.70	0.61	0.47
2008	Oklahoma	25,613	0.91	1.51	0.47
2003	Pennsylvania	56,673	0.62	0.15	
2008	Pennsylvania	62,986	0.91	1.51	0.47
2005	South Carolina	30,504	0.81	1.56	0.39
2010	South Carolina	37,077	0.94	1.02	0.48
2004	Tennessee	43,015	0.76	0.66	0.54
2009	Tennessee	47,853	0.73	1.09	0.46
2007	Texas, Iowa, Minnesota	279,717	0.65	0.32	
2012	Texas, Iowa, Minnesota	271,893	0.43	0.13	0.17
2006	Virginia	36,673	2.12	0.97	1.37
2011	Virginia	38,298	0.47	0.39	0.57
2006	Wisconsin	28,232	0.58	0.61	0.45
2011	Wisconsin	28,126	0.70	0.85	0.54
2007	WSCA	252,120	0.95	0.36	
2012	WSCA	244,289	0.38	0.18	0.54

Notes: Net price bids are dollars per 26 reconstituted ounces of formula. The Western States Contracting Alliance (WSCA) is comprised of 14 States: Alaska, Arizona, Delaware, Hawaii, Idaho, Kansas, Maryland, Montana, Nevada, Oregon, Utah, Washington, West Virginia, and Wyoming, and the District of Columbia.
The New England and Tribal Organization (NEATO) is comprised of five States: Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island.

Source: Data on numbers of participating infants come from USDA, Food and Nutrition Service (2014a); net price bids are based on data from USDA, Food and Nutrition Service (various years) and the Center on Budget and Policy Priorities (2008).

Appendix D—Number of Infants Participating in WIC by WIC State Agency in FY 2013

Appendix table D1	
State agency	Average monthly participation
Alabama	35,099
Alaska	5,583
Arizona	41,757
Arkansas	24,092
California	283,562
Colorado	22,330
Connecticut	13,682
Delaware	5,290
District of Columbia	4,639
Florida	116,862
Georgia	67,524
Hawaii	8,517
Idaho	10,289
Illinois	74,138
Indiana	40,206
Iowa	16,524
Kansas	17,376
Kentucky	34,075
Louisiana	38,082
Maine	5,348
Maryland	34,946
Massachusetts	27,733
Michigan	63,257
Minnesota	28,427
Mississippi	25,954
Missouri	36,622
Montana	4,813
Nebraska	9,389
Nevada	17,707
New Hampshire	3,973
New Jersey	37,861
New Mexico	13,852
New York	116,319
North Carolina	63,477
North Dakota	3,067
Ohio	68,232
Oklahoma	22,225
Oregon	23,075

Continued—

Appendix table D1—continued	
State agency	Average monthly participation
Pennsylvania	64,055
Rhode Island	5,577
South Carolina	33,627
South Dakota	4,440
Tennessee	43,544
Texas	226,938
Utah	15,270
Vermont	2,786
Virginia	38,479
Washington	37,540
West Virginia	11,538
Wisconsin	26,940
Wyoming	2,566

Note: WIC = Special Supplemental Nutrition Program for Women, Infants, and Children. Participation numbers do not include Territories and Indian Tribal Organizations.

Source: USDA, Food and Nutrition Service (2014a).