The Food Costs of Healthier School Lunches

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The U.S. Department of Agriculture proposed and adopted a new set of meal pattern requirements for the National School Lunch Program that will allow schools to claim 6 cents more in lunch reimbursement rates. This study analyzes the food costs of school menus in 2005 that met many of the proposed requirements. Overall, schools that served more, and more diverse, non-starchy vegetables had higher average food costs, and schools that served menus with lower calories had lower food costs. The food costs of school lunch menus that met the combined standards for dark green vegetables, orange vegetables, other vegetables, lowfat/fat-free milk, and fruit averaged 9 cents more per meal in 2005 dollars when other major factors that could affect food choices are taken into account. The main sources of higher costs appear to be related to the provisions for more vegetables.

Key Words: National School Lunch Program (NSLP), food assistance, nutrition, school food service, NSLP costs

The National School Lunch Program (NSLP) is the nation's second largest food assistance program, serving low-cost or free lunches to over 31.6 million children on a daily basis. In December 2010, Congress passed the Healthy, Hunger-Free Kids Act (PL 111-296), which expands access to school meal programs, gives the U.S. Department of Agriculture new regulatory powers to influence the quality of foods offered at schools, and makes important changes to the way the program is administered. One of the many changes included is an increase of 6 cents in the lunch reimbursement rate for schools that comply with new meal pattern requirements. USDA released proposed meal pattern requirements in early 2011, and if the proposed requirements become law, schools should receive the higher reimbursement rates by school year 2012–2013.[1]

This research looks at the relationship between the cost and healthfulness of NSLP lunches by comparing the food costs of schools whose menus met many of the proposed standards in school year 2004–2005 to costs at those schools whose menus did not. The analysis also tests whether meeting most of the standards significantly affects measured food costs in a multivariate framework that takes into account other factors that may influence school lunch food costs. The analysis allows us to infer which of the proposed standards contributes most to costs—whether it is the standards that apply to vegetables or the standards that apply to fruit, for example.

The approach used here differs slightly from previous analyses in that it measures differences in food costs of healthier menus versus less healthy menus that existed across schools. Two previous

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The analysis and conclusions herein reflect the author's views and not necessarily those of the Economic Research Service or the U.S. Department of Agriculture.

[1] The proposed requirements were modified slightly and issued in a final rule on January 26, 2012 (Federal Register 2012) just prior to publication. The main relevant difference between the adopted and the proposed requirements analyzed here was the removal of the proposed restriction on the amount of starchy vegetables that could be served per week.

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studies assigned costs to hypothetical menus designed to meet all of the new standards. The advantage to the approach used here is that actual menus are compared, but the disadvantage is that because no school met all of the new standards in 2005, the full food cost of all the new standards together is not estimated. Instead, the analysis estimates cost differences for various components and subsets of the standards.

The findings here are consistent with those of two other studies looking into this question; both of the studies found that healthier meals are more costly. In this analysis, schools that met many of the new requirements had higher per-menu food costs in 2005–2006 than schools that did not meet those requirements. But schools meeting two of the new standards that call for lower quantities of certain foods were found to reduce menu costs. Overall, this analysis provides evidence that an increase in the reimbursement rate is probably warranted, but a specific rate increase is not implied.

Background and Previous Research

Recent studies have shed light on the school meal programs' effects on children's health and obesity outcomes (Campbell et al. 2011, Millimet, Tchernis, and Husain 2009, Schanzenbach 2009, Gleason and Dodd 2009, Gordon et al. 2007, Gleason and Suitor 2003, Hofferth and Curtin 2005). Many of the studies that control for self-selection show positive links between school meal participation and obesity. Such evidence, together with widespread belief that school meal quality needs to improve, has provided public support for USDA's efforts to revamp nutrition and meal planning standards (IOM 2009). But school food providers have claimed that healthier standards would be too expensive to meet since they are already operating under tight budgets (Bartlett, Glantz, and Logan 2008). These cost concerns and the public pressure for change culminated in the 2010 legislation's historic increase in meal reimbursements for meals that meet the new standards.

School nutrition advocates have long cited the need for higher reimbursement rates for school food providers to be able to serve healthier foods. However, because of the paucity of relevant data, there has been little verification of this claim. It is complicated by the fact that the assertion concerns both revenues and costs. On the revenue side, the question is whether total revenues are sufficient to cover the costs of healthier foods. The federal per-meal reimbursement is only one component of total revenues, so the question is whether all components are sufficient. From the recent study of school meal costs and revenues using data from 2005, total revenues were composed of 50.6 percent USDA subsidies, 24.2 percent student payments for reimbursable meals, 15.8 percent à la carte, adult meals, and other non-reimbursable food sales, 8.8 percent state and local funds, and 0.6 percent other funds (Bartlett, Glantz, and Logan 2008).

Recent attention has focused on revenues from paid lunches and from the sale of foods that are not part of the reimbursable meal (Neuberger and Namian 2010). Bartlett, Glantz, and Logan (2008) found that average revenues for paid lunches and à la carte items were far below average costs. In school year 2005–2006, the mean reported cost for a reimbursement lunch was $2.36 when averaging over school food authorities (rather than the number of meals served), while the reimbursement rate for a free lunch was $2.51; that is, revenue from the free rate was 106 percent of cost.[2] For nonreimbursable meals, which include à la carte, adult meals, and miscellaneous sales, the mean reported revenues were 71 percent of costs. The average price charged to students for a full-price lunch was $1.60, with a range of $0.65 to $3.00 (Gordon et al. 2007), far below the average reported cost of $2.36. The 2010 legislation addresses these issues by requiring gradual increases in the full prices charged and requiring that revenues from non-reimbursable school foods cover average costs.

On the cost side, the issue is whether healthier meals cost more to provide. This is a simpler question, but still hard to fully address with available data. Food costs can be estimated by combining data from the two datasets mentioned, but the labor and capital costs of lunches that meet the new standard cannot. Labor and capital costs are available in one dataset, the School Lunch and Breakfast Cost Study II (SLBCS-II), but they are

[2] The reported cost of an NSLP lunch represents the costs that schools expect to cover from their revenues. Bartlett, Glantz, and Logan (2008) also presents results using "full" costs, which take into account all school foodservice costs that are often paid for by school districts. The differences by revenue source are similar.

not linked to the representative menus that are also available from the School Nutrition and Dietary Assessment III study (SNDA-III). Therefore this analysis focuses on the narrower question of food costs for which representative data are available. This is similar to the approach taken by the Institute of Medicine (IOM) Committee in its analysis of the impact of new nutrition standards (IOM 2009).

USDA's proposed nutrition requirements are based on recommendations made to USDA by the Institute of Medicine (IOM 2009). The requirements include increases in the number of servings of fruits and vegetables, whole grains, and the use of only lowfat or fat-free milk. The current requirements and the proposed standards are summarized in Table 1. Along with its recommendations, the IOM Committee published an analysis of the cost implications. It compared the costs of healthier versus less healthy meals, where its comparison consisted of a set of "representative baseline" menus and "modified baseline" menus, the second of which incorporated its recommendations. It used matched data from SNDA-III and SLBCS-II to estimate the cost differences. There are two main differences between IOM's analysis and this one. First, the IOM study created hypothetical menus that included all of the new standards in order to measure the different costs. IOM's "modified menus," the ones that met all of the proposed standards, were based on the Committee's nutrition expertise and understanding of what foods students would accept. Second, the IOM study used only a subset of the school menus available in SNDA-III, whereas this study uses all of them. IOM's study produced a range of cost estimates depending on different assumptions made, but its main conclusion was that the food cost for lunch under the new meal patterns would be 4 percent higher.

The other major analysis of the cost of the proposed new rule was done by USDA's Food and Nutrition Service (FNS) in the "Regulatory Impact Analysis" that was published with the proposed rule (Federal Register 2011). The approach of FNS was to link foods served in SNDA-III and food prices in SLBCS-II by first computing weighted aggregates of foods and their prices by type (with special categories for combination entrées). The baseline food cost for a meal from the NSLP or the School Breakfast Program was provided by the sum of per-meal costs over all food types served in SNDA-III plus adjustments for inflation and projected participation increases. For the proposed rule estimate of food costs, it calculated the food-level contributions of the SNDA-III menus toward the requirements and then added quantities needed in the different food group categories to meet the requirements. The total cost was the product of the quantities served and the prices from SLBCS-II, plus adjustments for inflation and participation growth. FNS found that food costs would increase by 3.4 cents per lunch served in the first two years and by 7.2 cents per lunch served after that, when the requirement that all grains must be majority whole grains will have phased in. This approach effectively assumes that schools are homogeneous in the types of foods provided.

The approach used here differs from the IOM and FNS studies by comparing the costs of actual menus that met many of the proposed standards. School lunch menus were fairly diverse in 2005, as shown by the SNDA-III report (Bartlett, Glantz, and Logan 2008).[3] Variation in menu items offered provides an opportunity to test for significant differences in food costs by menu type. According to the SNDA-III report, 29 percent of all schools offered a dark green vegetable or deep yellow vegetable, 83 percent offered lowfat milk, and 10 percent offered some kind of legume for every day in 2005. While those are not exactly the proposed requirements, they show that some schools were already moving in that direction.

Data

School menu data come from the School Nutrition Dietary Assessment Data III (SNDA-III), and the costs of those menus are estimated using data from the School Lunch and Breakfast Cost Study II (SLBCS-II). The two datasets are nationally representative and were collected within a year of each other; SNDA-III was collected in the spring of 2005, and the SLBCS-II was collected in school year 2005–2006. The SNDA surveys provide the nation's most complete data on the nutritional content of school meals; the most recent, SNDA-III, has data from 397 schools. The SLBCS-II provides data from an analysis of the cost of producing reimbursable school meals from 393 schools.

[3] See Gordon et al. (2007, p. 123).

Table 1. Summary of Changes in Weekly Minimum Amounts and Types of Food Offered for Lunch

	Current Requirement	Proposed Requirement
Fruit and vegetables	2.5–5 cups of fruit and vegetables combined per week	2.5–5 cups of fruit plus 3.75–5 cups of vegetables per week
Vegetables	No specifications as to type of vegetable	Weekly requirement of half a cup for dark green and orange vegetables and legumes and limit on starchy vegetables to one cup
Meat/meat alternate	7.5–15 oz equivalents per week	8–12 oz equivalents per week
Grains	8–15 oz equivalents per week	9–13 oz equivalents per week
Whole grains	Encouraged, but not required	Upon implementation, at least half of the grains to be whole grain-rich (> 50% whole grain). After two years, all grains must be whole-grain rich
Milk	5 cups	5 cups, fat content of milk to be 1% or less
Saturated fat	Energy from saturated fat must be no greater than 10% of total energy	No greater than 10% of total energy
Total fat	Energy from total fat must be no greater than 30% of total energy	No standard for total fat
Calories	Minimum of 633 for grades K–3, 785 for grades 4–12, or 825 for optional grades 7–12 [a]	550–650 grades K–5, 600–700 grades 6–8, and 750–850 grades 9–12 [b]

[a] The minimum calories shown are for use with food-based menu plans. They differ slightly for the enhanced food-based menu plan and the nutrient-based menu plan. See USDA (2011) for the other calorie standard options. However, the proposed rule will require that all schools follow a food-based menu planning approach to plan school lunches and breakfasts for all children. Most schools (70 percent) are already using that approach (Federal Register 2011).

[b] Under the proposed rule, all schools will be required to use the following age/grade groups to plan lunches and breakfasts: grades K–5 (ages 5–10 years), grades 6–8 (ages 11–13 years), and grades 9–12 (ages 14–18) (Federal Register 2011).

Source: ERS summary of information provided in the table entitled "Changes in Minimum Amounts and Types of Food: Lunch" (Federal Register 2011).

This analysis focuses on an assessment of food costs for lunches but not breakfasts because the food price data for lunches is more reliable for this type of application, and the lunch program is where most of all school meals are served.

The proposed standards are designed to apply to both weekly and daily amounts of food served. The analysis here uses the weekly amounts to define basic compliance. Schools may meet the daily amounts on most days of the week and overall meet the weekly requirement but fall just short of meeting the requirement every day. The weekly requirement provides a general portrayal of how a school is performing over time. There is the theoretical possibility that a school in the data could have served large amounts of a given required item and that way qualify for a weekly total, but there was no instance of this in the data.

Food type sub-categories in the menu data and their portion amounts were used to assess whether schools had met the proposed weekly standards. Most of the proposed food standards are specified in cups or ounces, while the portion size data in SNDA-III is in grams. Portions in grams were converted to cups and ounces using the MyPyramid Equivalents Database, which takes into account differences by food type (Bowman, Friday, and Moshfegh 2008). Since the conversion rates are estimates of the amount of cups from grams, compliance with the standards is measured exactly and also relaxed by 5 percent as an alternate measure. See Table 2 for the standards and the values that represent a 5 percent addition or subtraction.

For entrée type foods that are characterized in the SNDA-III data as "combination entrées" or "meat/meat alternates," many of the conversion rates were not available (grams to cups/ounces). Because of this and the fact that the proposed standard does not differ greatly from the existing

Table 2. Proposed Weekly Standards and Relaxed Weekly Standards Used in Analysis

	Weekly Standards			Relaxed Weekly Standards		
	Grades K–6	Grades 6–8	Grades 9–12	Grades K–5	Grades 6–8	Grades 9–12
Fruit (cups)	≥ 2.5	≥ 2.5	≥ 5	≥ 2.375	≥ 2.375	≥ 4.75
100% fruit juice can be up to half of total	≤ 1.25	≤ 1.25	≤ 2.5	≤ 1.3125	≤ 1.3125	≤ 2.625
Vegetables (cups)						
Dark green	≥ 0.5	≥ 0.5	≥ 0.5	≥ 0.475	≥ 0.475	≥ 0.475
Orange	≥ 0.5	≥ 0.5	≥ 0.5	≥ 0.475	≥ 0.475	≥ 0.475
Legumes	≥ 0.5	≥ 0.5	≥ 0.5	≥ 0.475	≥ 0.475	≥ 0.475
Starchy	≤ 1	≤ 1	≤ 1	≤ 1.05	≤ 1.05	≤ 1.05
Other	≥ 1.25	≥ 1.25	≥ 2.5	≥ 1.875	≥ 1.875	≥ 2.375
Total vegetables	≥ 3.75	≥ 3.75	≥ 5	≥ 3.5625	≥ 3.5625	≥ 4.75
Whole grains (% of grain servings)	≥ 25	≥ 25	≥ 25	≥ 23.75	≥ 23.75	≥ 23.75
Fat-free milk (plain or flavored) or lowfat milk (1% millk fat or less) (cups)	≥ 5	≥ 5	≥ 5	≥ 4.75	≥ 4.75	≥ 4.75
Mini-max calories (calories)	550–650	600–700	750–850	522.5–682.5	570–735	712.5–892.5
Saturated fat (% of total calories)	≤ 10	≤ 10	≤10	≤ 10.5	≤ 10.5	≤ 10.5

standard, the standard for "Meats, beans, cheese, and yogurt" was not included in this analysis. The grain standard for quantity of grains served was not included for the same reason. The sodium standard was not included since the sodium targets do not need to be met until 2020.

The menu food cost for each school lunch in SNDA-III was derived using all of the food items offered to students, weighted each day, and averaged over the week. Food items from SNDA-III were matched to food items and their average prices in the SLBCS-II. The food price data were not collected with the intention of providing nationally representative data on food-level prices per se. But the foods available there were well matched to those in SNDA-III. In less than 5 percent of cases were food items somewhat difficult to match, but relatively close matches were found, and those foods were included.

SNDA-III food items were weighted by the "offer weight" available in the dataset to account for the relative amounts of different food items offered on a given day. Here the term "offered" refers to all of the food prepared for consumption for a given day. For example, if smaller total amounts of green beans are offered, and a relatively large amount of mashed potatoes is offered, the "offer weight" accounts for the amount differences in the total offering.[4]

[4] The two other studies mentioned above (IOM and USDA/FNS) chose to also use the weight that takes into account the foods selected by students ("serve weight"). That weight was not used here in order to keep the focus on the foods offered by school food providers since the standards are defined in terms of food offered to students. Students have the right, in most schools, to refuse some portion of the NSLP meal (referred to as "offer versus serve"). But schools will have to offer the food to them, and the issue of student acceptance is a slightly different question. It is indeed a crucial question since schools want to minimize loss and waste. However, schools that were voluntarily meeting higher nutrition standards in 2005 are likely to have figured out how to prepare acceptable foods since they would not want to operate at a large loss.

Methods

To analyze whether there are meaningful food cost differences between healthier and less healthy menus, the analysis tests for significant differences in the estimated average costs of menus that meet the standards. However, it is important to underline the fact that the price data are available at the national level, not at a regional level or other levels that may reflect differences in costs that schools may face. This is a weakness of the data since different schools are likely to face different prices for the same foods.[5] This analysis essentially tests how costs differ by menu composition. Sample weights and sample design variables for clusters and strata are used in all parts of the analysis.

The analysis also tests for significant cost differences in a simple OLS regression that takes into account important characteristics of the school food environment that may also affect menu composition. The effect of each standard on menu food costs is measured separately. In total, 13 equations are estimated, one for each standard included as a dummy variable. Two of these equations include two combinations of standards also examined. This approach assumes that there is a fair degree of homogeneity across menu entrées, or alternatively, that differences across a week for a given school are similar for all of the schools.

Many factors could influence menu offerings, such as region and whether the school is in an urban, suburban, or rural area. Different parts of the country have different norms about what foods are acceptable and appropriate for children. The limited sample size makes it difficult to fully capture regional differences, but dummy variables for seven regions and urban, suburban, or rural areas are included.

The size of the lunch program may also affect the types of foods offered since a larger student body may require more variety and may influence menu composition in other ways. The size of the program was measured with a constructed variable estimate for the average number of lunches served per day. This was estimated because total enrollment and the actual numbers for participation in the school lunch program are masked in SNDA-III in order to protect individual schools from being identified in the data. However, the variable is available for only 242 schools, which significantly reduces the regression sample size. And in that smaller sample, the variable was never significant in different model specifications. Therefore, it was not included, and instead another variable that directly represents menu diversity was. It is the average number of different menu items offered on a given day, and it has no missing values.

The cost of food used in school lunches is also affected by the costs of labor and capital. If wage rates are high, schools may find it too expensive to prepare fresher food that requires more manual labor. And preparation of some foods may require different types of equipment, like more cold storage equipment for fresh produce. Unfortunately, due to the lack of data a full cost function cannot be estimated. However, the regression includes variables that describe the nature of the kitchen and cafeteria operations that may influence menu composition indirectly via capital and labor constraints. These variables include the use of a food management company, the inclusion of food from chain restaurants, whether the school serves breakfast, the offering of à la carte foods, and whether the school serves as a base kitchen for other cafeterias.

Other factors that are thought to potentially affect food costs because they may affect the amount, type, and/or diversity of menu items offered include the type of school (elementary versus middle/high school) and the method of menu planning (traditional food-based, enhanced food-based, or nutrient-based).[6] Also included is a set of variables about district-level policies that may affect purchasing decisions; these include whether the district purchases food through either DoD Fresh[7] or a state farm-to-school program, whether the district purchases food through a cooperative,

[5] Todd, Leibtag, and Penberthy (2011) find considerable geographic variation in the relative price of healthy foods. And Ollinger, Ralston, and Guthrie (2011) found regional cost differences in school food service total costs.

[6] Historically, schools have used a food-based method for planning menus where each meal must consist of certain food item types such as a meat, vegetable, starch, etc. This is the "traditional" method, and in recent years, schools have been encouraged to use a nutrient-based method instead where meals are planned according to the nutrient content of food items. Or they can use a mix of methods called the "enhanced traditional" method.

[7] "DoD Fresh" is the short name for a program that allows schools to purchase fresh produce from food distribution networks administered by the Department of Defense.

whether the district's purchases must have a nutrient information label, and whether the School Food Authority (SFA) has a local wellness policy or a nutrition education program.

Some of the controls may really be capturing the effects of the standards themselves, so including them in the regression with measures of the standards' effects may be overly cautious. For example, to account for differences in the general diversity of menus offered, a measure of the number of different food items typically offered was included. Still, it is important to include the control for general diversity of offerings to separate the effect of more vegetable offerings from more offerings of items in total. Similarly, regional norm differences may reflect preferences for healthier food, and if so, those dummies capture the effects of healthier foods on the menu food costs.

The inclusion of the variable for à la carte food offerings reduces the sample size to 272. It is important to include because the policy of offering à la carte food may affect the composition of foods offered in the reimbursable meal. Schools may have chosen foods that are easily sold as individual items rather than more diverse offerings of fruits or vegetables, for example. There is no strong prior expectation about the effect of à la carte food on food costs, but it is an important feature that could affect the types of foods sold as part of the regular menu. Because there are so many missing values for this variable, the analysis was conducted with and without it.

Results

Distribution of Schools by Whether They Met the Proposed Standards

Many schools met one or more of the proposed standards in 2005, but no school in the analysis sample met all of the proposed standards. And only small numbers of schools met various combinations of the standards. Table 3 shows the distribution of schools that met individual standards and different subsets of the proposed standards.

For the sake of comparison, Table 4 shows the shares of schools that met current standards (then current as well). Most schools met all of the standards with the big exception of what were then two standards for fat: the percent of energy from saturated fat and the percent of energy from total fat (the proposed standards do not include total fat). The high levels of non-compliance with both of these standards in the past did not generally preclude a school from receiving reimbursements. USDA intends to conduct more frequent monitoring in the future, especially since the new reimbursement rate is supposed to be linked to performance, but the extent will depend on funding availability.

Table 3 also shows how the shares meeting the proposed standards differ by school type and how they differ by the exact versus relaxed measure. In the first column of results showing schools that met the exact standards for all schools, most of the shares range from a fourth to almost a half, with three exceptions. Only 4 percent of schools served at least half of bread or grains as "whole-grain rich" (more than half whole grain). This is probably an underestimate given that it does not include entrée combination foods which are likely to have included some instances of whole-wheat crust for pizza or breads. On the other hand, student acceptance of whole grains has been said to be challenging to school food providers, and thus a low rate of whole grain usage was expected.[8] "Legumes" is the other food type that few schools served in the amounts proposed; 15 percent of schools served legumes in 2005. Among the individual standards that were met by many schools, the fruit and milk standards stand out: 46 percent of schools met the fruit standard, while 41 percent met the milk standard. But when the milk standard is relaxed by 5 percent, a lot more schools—77 percent—met the lowfat milk standard. And similarly, a lot more schools met the saturated fat standard when it is relaxed: 44 percent of schools met the more relaxed standard compared to 28 percent that met the exact standard.

The results differ by school type. Surprisingly, middle and high schools have higher shares of schools meeting most of the standards than do elementary schools. In only two cases, the fruit standard and the starch standard, did elementary schools have higher shares. This is surprising since older children who have more autonomy over meal selection are generally thought of as choosing less healthy foods.

[8] While all Americans consume much lower amounts of whole grains than recommended, children consume even lower amounts according to Lin and Yen (2007).

Table 3. Distribution of Schools That Met Selected Proposed Standards

Proposed Weekly Standards	Weighted Share: All Schools, Met Exact Std.	Weighted Share: All Schools, Met Relaxed (-5%) Std.	Weighted Share: Elem., Met Exact Std.	Weighted Share: Middle, Met Exact Std.	Weighted Share: High School, Met Exact Std.	Weighted Share: Elem., Met Relaxed (-5%) Std.	Weighted Share: Middle, Met Relaxed (-5%) Std.	Weighted Share: High School, Met Relaxed (-5%) Std.	Unweighted Numbers of Schools: All Schools, Exact	Unweighted Numbers of Schools: All Schools, Relaxed (-5%)
SINGLE STANDARDS										
Fruit	0.46	0.48	0.47	0.46	0.41	0.49	0.47	0.43	206	215
Vegetables										
Dark green	0.26	0.26	0.24	0.34	0.28	0.24	0.34	0.28	124	125
Orange	0.26	0.29	0.26	0.25	0.26	0.28	0.33	0.30	120	134
Legumes	0.15	0.15	0.11	0.17	0.26	0.11	0.19	0.25	81	82
Starchy	0.33	0.34	0.41	0.23	0.18	0.41	0.25	0.18	130	107
Other	0.40	0.42	0.41	0.47	0.26	0.44	0.52	0.28	175	187
Total vegetables	0.37	0.39	0.38	0.62	0.11	0.39	0.64	0.13	160	166
Whole grain rich (25% of bread/grain offered)	0.04	0.04	0.04	0.06	0.03	0.04	0.06	0.03	30	30
Fat-free milk (plain or flavored) or lowfat milk	0.41	0.77	0.41	0.38	0.45	0.75	0.81	0.78	180	317
Mini-max calories (different by grade level)	0.22	0.34	0.18	0.18	0.38	0.30	0.26	0.58	97	155
Saturated fat (<10% of total calories)	0.28	0.44	0.27	0.27	0.32	0.42	0.39	0.55	136	185
COMBINATIONS OF STANDARDS										
Three vegetable stds. (dark green, orange, and other)	0.06	0.07	0.06	0.07	0.03	0.06	0.10	0.04	36	40
Three-vegetables, lowfat/fat-free milk, sat fat, calories, and fruit	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.01	2	7
Three-vegetables, lowfat/fat-free milk, sat fat, and fruit	0.01	0.02	0.01	0.02	0.01	0.01	0.03	0.02	12	16
Three-vegetables, lowfat/fat-free milk, sat fat, and calories	0.00	0.02	0.00	0.00	0.01	0.01	0.01	0.03	3	12
Three-vegetables, lowfat/fat-free milk, and fruit	0.02	0.03	0.02	0.03	0.02	0.03	0.05	0.02	17	24
Three-vegetables, lowfat/fat-free milk, and calories	0.00	0.02	0.01	0.00	0.01	0.02	0.01	0.03	5	14
Number of schools	397	397	144	127	126	144	127	126	397	397

Note: Standards for meat, sodium, and transfat are not included.

Table 4. Distributions of Schools That Met Selected Current Standards

Current Weekly Standards	Weighted Share		Unweighted Numbers of Schools	
	Schools That Met ...		Schools That Met ...	
	Weekly Standards	Relaxed Weekly Standards (-5%)	Weekly Standards	Relaxed Weekly Standards (-5%)
SINGLE STANDARDS				
Fruit and Vegetables				
2.5–5 cups of fruit and vegetables combined per week	0.976	0.979	385	387
Milk				
5 cups	0.999	1.000	396	397
Minimum calories (different by grade level)				
Minimum of 633 for grades K–3, 785 for grades 4–12, or 825 for optional grades 7–12	0.766	0.848	262	305
Saturated fat				
Energy from saturated fat must be no greater than 10% of total energy.	0.281	0.440	136	185
Total fat				
Energy from total fat must be no greater than 30% of total energy.	0.194	0.321	95	151
COMBINATIONS OF STANDARDS				
All standards except the two fat standards	0.764	0.844	260	301
All standards	0.064	0.153	37	76
Total schools in sample	397	397	397	397

Very few schools met combinations of the standards, as also shown in Table 3. At best, 6 percent of schools met three new vegetable standards (dark green, orange, and other), but adding more standards reduces the shares meeting all standards to 1, 2, or 3 percent of schools. This suggests that while many schools adhered to some healthful standards, such as serving more fruit or reduced amounts of starchy vegetables, there were very few schools that served meals that were across-the-board more healthy.

Because so few schools met multiple standards, the cost analysis focuses on a comparison of schools that met individual standards and just two combinations of standards: (i) the 3-vegetable standards described above, and (ii) the 3-vegetable standards plus the standards for fruit and low-fat milk.

Food Cost Differences: Bivariate Results

The weighted average food cost for all of the schools' average weekly lunch food costs was $1.04 (in school year 2005–2006 dollars). This is fairly close to the $1.09 found in the SLBCS-II report, which used annual invoice data to estimate the average food cost per menu.[9] This is reassuring given that the approach here uses the detailed food price data (from SLBCS-II) rather than the

[9] From the SLBCS-II report: "For the average SFA, reported food costs per reimbursable lunch were $1.09 in SY [school year] 2005–2006, with mean reported labor costs of $1.05, and other costs averaging $0.23. There was relatively little variation among SFAs in food costs per reimbursable lunch—in almost half of all SFAs (48 percent), food costs per reimbursable lunch were between $0.90 and $1.20 (Appendix D, Exhibit D.10)" (Bartlett, Glantz, and Logan 2008, pp. 3–7).

annual cost data used in the SLBCS-II report to arrive at the food cost estimate.

Table 5 shows the cost differences for schools that met standards on an individual basis. The table shows whether the school met the standard exactly or was within 5 percent of meeting the standard. The menu food costs of schools that met the standards were generally higher than those of schools that did not meet the corresponding standards, and this was true whether schools met the standard exactly or whether they came within 5 percentage points of meeting the standard. Schools that met the separate standards for dark green vegetables, legumes, other vegetables, and total vegetables had significantly higher average food costs. The largest differences for vegetable standards are seen for other vegetables and total vegetables: menus that met either of these were 11 cents higher in food costs. Menus that met the dark green and legume vegetable standards had differences of 5 and 6 cents, respectively. Interestingly, for schools that met the starchy standard (a *reduced* amount of starchy vegetables), food costs were significantly lower (by 8 cents), and the same was true for schools that met the revised calorie limits (lower by 11 cents). Both of these results are consistent with the fact that serving less of any food will cost less. Average food cost differences for school menus that met the fruit, orange vegetables, and saturated fat standards were not significantly different from menus that did not meet those individual standards.

Schools meeting the relaxed milk standard (4.75 cups per week instead of 5) had significantly higher menu costs, by 6 cents, but there was only a 2 cents difference for schools that served 5 cups or more. Many more schools met the relaxed milk standard than met the exact one, so the result may have more to do with the larger sample of schools and perhaps the type of milk they were serving. Flavored milk costs more than unflavored milk, and flavored skim milk is permitted. This may explain why schools meeting the relaxed milk standard have higher costs than the smaller set meeting the exact standard.

Schools that met the 3-vegetable standard had 14 cents higher average food costs. And schools that met the second combination of the 3-vegetables, fruit, and lowfat milk standards had 12 cents higher average food costs.

Food Cost Differences: Regression Results

Table 6 shows the summary statistics for the variables in both regression samples. The regression results are shown in Tables 7 and 8. Among the individual standard dummies, serving other vegetables leads to higher food costs, by almost 9 cents, and serving the right amount of total vegetables leads to a 7 cent higher food cost. The minimum and maximum calorie limits significantly reduce costs, by almost 9 cents, and the two combinations of standards each raise costs by about 9 cents. The results change for several of the standards after controlling for other school characteristics that may affect menu offerings; the standards for dark green vegetables, legumes, and starchy vegetables are not significant in the regression, though they were significant in the bivariate results.

But the regression results for the effects of the standards do not differ greatly by whether we use the smaller sample that allows for testing the effects of serving à la carte foods or the larger sample that does not; they differ in magnitude but not in statistical significance. Table 6 shows that the large and small samples are similar in many ways, but since the smaller sample may not be nationally representative, the larger sample is preferred. The main difference seems to be that when the à la carte variable is included, school type and several regions are no longer significant.

The results suggest that schools that served à la carte foods had significantly higher menu food costs, by 7 to 8 cents. The notion that serving à la carte foods raises average food costs is consistent with a school preparing more and different kinds of food for sale, especially since those foods may be used in the reimbursable meal or sold as separate items. This may be particularly true if the school serves more entrée foods in order to be able to sell them separately. The fact that it raises costs so significantly is interesting in light of the problem found by Bartlett, Glantz, and Logan (2008) that à la carte revenues were not being covered by à la carte costs (which included labor and capital as well as food costs). The results here show that, even in a smaller sample, à la carte foods are an important component of food costs.

In the regression using the full sample, elementary schools have significantly lower costs, by about 8 cents. This may be due to the fact that

Table 5. Mean Lunch Menu Food Costs by Standard Relaxed Standards

	WEEKLY STANDARDS							
	Mean Lunch Menu Food Costs (2005 dollars)					Mean Lunch Menu Food Costs (2011 dollars)		
	Schools That Don't Meet	Schools That Meet	t-stat	*	Difference	Schools That Don't Meet	Schools That Meet	Difference
Fruit	$1.04	$1.03	-0.81		-0.02	$1.23	$1.21	-0.02
Vegetables								
Dark green	$1.02	$1.07	1.69	*	0.05	$1.21	$1.26	0.05
Orange	$1.03	$1.06	1.23		0.03	$1.21	$1.25	0.04
Legumes	$1.03	$1.08	1.74	*	0.05	$1.21	$1.27	0.06
Starchy	$1.07	$0.98	-3.89	*	-0.09	$1.26	$1.15	-0.11
Other	$0.99	$1.10	4.28	*	0.11	$1.17	$1.30	0.13
Total vegetables	$1.00	$1.10	4.43	*	0.11	$1.18	$1.30	0.12
Whole grains	$1.03	$1.06	0.60		0.03	$1.22	$1.26	0.03
Lowfat/fat-free milk	$1.03	$1.05	0.93		0.02	$1.21	$1.24	0.03
Mini-max calories	$1.05	$0.98	-2.23	*	-0.08	$1.24	$1.15	-0.09
Saturated fat	$1.02	$1.07	1.63		0.04	$1.21	$1.26	0.05
Three vegetable stds. (dark green, orange, & other)	$1.03	$1.17	2.55	*	0.14	$1.21	$1.38	0.17
Three-vegetables, lowfat/fat-free milk, and fruit	$1.03	$1.15	4.71	*	0.12	$1.22	$1.36	0.14
	RELAXED WEEKLY STANDARDS (-5%)							
	Mean Lunch Menu Food Costs (2005 dollars)					Mean Lunch Menu Food Costs (2011 dollars)		
	Schools That Don't Meet	Schools That Meet	t-stat	*	Difference	Schools That Don't Meet	Schools That Meet	Difference
Fruit	$1.05	$1.02	-1.23		-0.03	$1.24	$1.21	-0.03
Vegetables								
Dark green	$1.02	$1.07	1.68	*	0.05	$1.21	$1.26	0.05
Orange	$1.03	$1.05	0.93		0.02	$1.21	$1.24	0.03
Legumes	$1.03	$1.09	1.96	*	0.06	$1.21	$1.28	0.07
Starchy	$1.06	$0.98	-3.52	*	-0.08	$1.26	$1.16	-0.10
Other	$0.99	$1.10	4.28	*	0.11	$1.17	$1.30	0.13
Total vegetables	$0.99	$1.10	4.30	*	0.11	$1.17	$1.30	0.13
Whole grains	$1.03	$1.06	0.60		0.03	$1.22	$1.26	0.03
Lowfat/fat-free milk	$0.99	$1.05	2.48	*	0.06	$1.17	$1.24	0.07
Mini-max calories	$1.07	$0.96	-3.73	*	-0.11	$1.27	$1.14	-0.13
Saturated fat	$1.02	$1.06	1.40		0.04	$1.20	$1.25	0.04
Three vegetable stds. (dark green, orange, & other)	$1.03	$1.17	2.95	*	0.14	$1.21	$1.38	0.17
Three-vegetables, lowfat/fat-free milk, and fruit	$1.03	$1.21	3.17	*	0.18	$1.22	$1.43	0.22

* Statistically significant ($p < 0.10$).

Table 6. Summary Statistics for Regression Analysis Sample

	Regression Sample with à la Carte				Regression Sample without à la Carte			
	Mean	Std. Error	Min.	Max.	Mean	Std. Err.	Min.	Max.
Average food cost ($2005)	1.04	0.02	0.67	1.68	1.04	0.01	0.67	2.13
Elementary school	0.59	0.03	0.00	1.00	0.61	0.03	0.00	1.00
Middle/high school	0.41	0.03	0.00	1.00	0.39	0.03	0.00	1.00
City	0.31	0.05	0.00	1.00	0.32	0.05	0.00	1.00
Suburb	0.19	0.04	0.00	1.00	0.19	0.03	0.00	1.00
Rural	0.50	0.06	0.00	1.00	0.50	0.05	0.00	1.00
Mid-Atlantic	0.12	0.02	0.00	1.00	0.11	0.01	0.00	1.00
Midwest	0.19	0.02	0.00	1.00	0.20	0.02	0.00	1.00
Mountain	0.13	0.04	0.00	1.00	0.13	0.03	0.00	1.00
Northeast	0.08	0.01	0.00	1.00	0.09	0.01	0.00	1.00
Southeast	0.21	0.02	0.00	1.00	0.20	0.01	0.00	1.00
Southwest	0.15	0.02	0.00	1.00	0.15	0.02	0.00	1.00
Western	0.12	0.01	0.00	1.00	0.12	0.01	0.00	1.00
Nutrient-based menu plan	0.30	0.06	0.00	1.00	0.30	0.05	0.00	1.00
Enhanced food-based menu plan	0.20	0.04	0.00	1.00	0.20	0.04	0.00	1.00
Traditional food-based menu plan	0.50	0.06	0.00	1.00	0.50	0.05	0.00	1.00
Menu by food service mgt co.	0.04	0.02	0.00	1.00	0.07	0.02	0.00	1.00
Some foods from chain restaurant	0.29	0.05	0.00	1.00	0.30	0.05	0.00	1.00
Base kitchen	0.11	0.02	0.00	1.00	0.11	0.02	0.00	1.00
No à la carte foods sold	0.22	0.04	0.00	1.00				
Breakfast served at school	0.89	0.03	0.00	1.00	0.85	0.03	0.00	1.00
SFA purchases food through DoD or state farm-to-school	0.49	0.06	0.00	1.00	0.44	0.05	0.00	1.00
SFA participates in a purchasing co-op	0.49	0.06	0.00	1.00	0.48	0.05	0.00	1.00
SFA purchases based on nutrition requirements	0.57	0.06	0.00	1.00	0.54	0.05	0.00	1.00
SFA has wellness policy or nutrition education	0.74	0.04	0.00	1.00	0.77	0.03	0.00	1.00
Fruit standard	0.46	0.05	0.00	1.00	0.46	0.04	0.00	1.00
Dark green vegetable standard	0.27	0.04	0.00	1.00	0.27	0.04	0.00	1.00
Orange vegetable standard	0.27	0.04	0.00	1.00	0.26	0.04	0.00	1.00
Legumes vegetable standard	0.14	0.03	0.00	1.00	0.15	0.03	0.00	1.00
Starchy vegetable standard	0.37	0.05	0.00	1.00	0.34	0.04	0.00	1.00
Other vegetable standard	0.34	0.05	0.00	1.00	0.40	0.04	0.00	1.00
Total vegetables standard	0.38	0.05	0.00	1.00	0.38	0.04	0.00	1.00
Whole grains standard	0.05	0.00	0.00	1.00	0.04	0.00	0.00	1.00
Lowfat/fat-free milk standard	0.43	0.05	0.00	1.00	0.40	0.04	0.00	1.00
Mini-max calories standard	0.25	0.05	0.00	1.00	0.23	0.04	0.00	1.00
Saturated fat standard	0.31	0.05	0.00	1.00	0.30	0.05	0.00	1.00
3 vegetable (dark green, orange, other) standards	0.07	0.02	0.00	1.00	0.06	0.02	0.00	1.00
3 vegetable stds, lowfat/fat-free milk, and fruit standards	0.04	0.02	0.00	1.00	0.03	0.01	0.00	1.00
Number of observations	272				379			

Source: USDA Economic Research Service's analysis of School Nutrition Dietary Assessment III data.

Table 7. OLS Determinants of Average Food Costs in the National School Lunch Program: With à la Carte, Smaller Sample

	1	2	3	4	5
Rural	0.028	0.042	0.036	0.044	0.042
	0.025	0.026	0.026	0.027	0.027
Midwest	0.083*	0.092*	0.072	0.085*	0.085*
	0.047	0.049	0.048	0.049	0.048
Mountain	0.086*	0.095*	0.088	0.083	0.080
	0.049	0.051	0.054	0.051	0.050
Northeast	0.180***	0.198***	0.199***	0.200***	0.197***
	0.067	0.069	0.069	0.072	0.071
Western	0.119**	0.136***	0.138***	0.126***	0.124**
	0.047	0.049	0.049	0.048	0.047
No à la carte foods sold	-0.067**	-0.077**	-0.089***	-0.073**	-0.076**
	0.030	0.031	0.028	0.032	0.031
Traditional food-based menu plan	0.065**	0.068**	0.058**	0.069**	0.068**
	0.028	0.029	0.028	0.028	0.028
Average number of menu items	0.007***	0.009***	0.009***	0.009***	0.009***
	0.002	0.002	0.002	0.002	0.002
Other vegetable standard	0.076***				
	0.027				
Total vegetables standard		0.042*			
		0.024			
Mini-max calories standard			-0.078***		
			0.022		
3 vegetable (dark green, orange, other) standards				0.061*	
				0.032	
3 vegetable stds, lowfat/fat-free milk, and fruit standards					0.105***
					0.035
Constant	0.863***	0.828***	0.889***	0.832***	0.832***
	0.069	0.072	0.073	0.075	0.073
Observations	272	272	272	272	272
R-squared	0.458	0.439	0.458	0.436	0.439

Source: USDA Economic Research Service's analysis of School Nutrition Dietary Assessment III data.

Notes: Standard errors in parentheses. *** indicates $p < 0.01$, ** indicates $p < 0.05$, and * indicates $p < 0.1$. Dummy variables excluded: middle/high school, city, Mid-Atlantic region, and nutrient-based menu planning method. Costs are measured in 2005 dollars. Independent variables that were included but whose results are not shown: suburb, Midwest, Mountain, Southeast, Southwest, breakfast served at school, enhanced food-based menu plan, menu by food service management company, some foods from chain restaurant, base (or central) kitchen, district purchases food through DoD or state farm-to-school, district participates in a purchasing co-op, district purchases based on nutrition requirement, and district has wellness policy or nutrition education. Each of the following was added separately: fruit standard, dark green vegetable standard, orange vegetable standard, legumes vegetable standard, starchy vegetable standard, whole grains standard, lowfat/fat-free milk standard, and saturated fat standard.

Table 8. OLS Determinants of Average Food Costs in the National School Lunch Program: Without à la Carte, Larger Sample

	1	2	3	4	5
Elementary school	-0.089***	-0.081***	-0.078***	-0.076***	-0.073***
	0.023	0.024	0.023	0.024	0.024
Rural	0.015	0.033	0.037	0.043	0.044*
	0.025	0.026	0.026	0.026	0.026
Northeast	0.082	0.103	0.097	0.103	0.102
	0.063	0.064	0.063	0.063	0.063
Western	0.047	0.084*	0.092**	0.072	0.072
	0.047	0.047	0.043	0.044	0.044
Traditional food-based menu plan	0.049*	0.056*	0.041	0.049*	0.048
	0.028	0.030	0.029	0.029	0.030
Average number of menu items	0.009***	0.010***	0.011***	0.011***	0.011***
	0.002	0.002	0.002	0.002	0.002
Other vegetable standard	0.088***				
	0.023				
Total vegetables standard		0.071***			
		0.024			
Mini-max calories standard			-0.088***		
			0.021		
3 vegetable (dark green, orange, other) standards				0.094***	
				0.035	
3 vegetable stds, lowfat/fat-free milk, and fruit stds					0.085**
					0.041
Constant	0.834***	0.797***	0.837***	0.792***	0.776***
	0.069	0.073	0.068	0.071	0.072
Observations	379	379	379	379	379
R-squared	0.384	0.369	0.376	0.356	0.347

elementary schools are less likely to have à la carte foods, because this is one of the factors that is no longer significant when à la carte is added. Menu compositions from rural areas, the Northeast region, and the Western region had higher food costs than schools in cities or in the Mid-Atlantic, though the first two were mostly significant in models not shown.

Schools using a traditional meal plan had significantly higher menu food costs of about 5 cents compared to schools using a nutrient-based method. Perhaps the traditional meal plan leads to higher costs in this accounting because certain foods are required, as opposed to nutrients. Maybe the greater flexibility of nutrient targets helps to reduce the overall foods required. But then we would expect to see similar higher costs associated with the enhanced food-based menu plan, which also uses food types as targets, and we do not.

The average number of menu items offered on a given day was associated with 1 cent higher food costs. This provides a measure of the cost of diversity that is somewhat overlapping some of the new standards that require diversity. The fruit and vegetable standards require more and different items, but this provides an overall measure of the cost of just having to provide more items.

Overall, these findings suggest that among the new standards, the requirements to serve more

and different kinds of vegetables will raise menu food costs. And though schools implemented individual standards that have been proposed, few schools implemented them as a whole, or even in part, making it hard to test whether the standards together will lead to higher food costs. The small groups of schools that have met the two combinations of standards have significantly higher food costs, suggesting at least that those combinations as a group raise food costs.

Conclusions

This study examines the food costs of school lunch menus in 2005 and how they differed if they met nutrient standards that are slated to become the new set of USDA recommendations. Many schools met the proposed standards on an individual basis, such as the provision of a half cup of dark green vegetables per week or the provision of less than one cup of starchy vegetables in a week. However, only a small share of schools met multiple standards, and no school met all of them. The main conclusion is that school lunches that contained more and more varied vegetables had statistically significantly higher average food costs.

Bivariate analysis of the cost differences suggests that most of the individual standards will lead to higher menu food costs with the exception of standards that call for lower amounts of starchy vegetables and calories. Menus meeting those standards suggest they will lead to lower food costs. Menus that met the individual standards for dark green vegetables, legume vegetables, "other" (i.e., different) vegetables, and total vegetables were all higher in cost than menus that did not meet the respective standard. Menus meeting the other vegetable and total vegetable standards were each 11 cents higher in cost, while menus meeting the dark green and legume standards were 5 and 6 cents higher, respectively.

The bivariate results also show that school menus that met two different combinations of standards had significantly higher food costs. School menus that met three vegetable standards (dark green, orange, and other vegetables) had food costs of 14 cents higher. School menus that met those same three vegetable standards plus the standards for fruit and lowfat milk were 12 cents higher.

Regression analysis was used to control for characteristics that varied across schools, such as region, urbanicity, school food service operation characteristics, purchasing policies, nutrition requirements, etc. These factors are thought to potentially affect the types of foods chosen, which is what varies across schools in the way menu costs are calculated here. Controlling for these other factors, and conducting the regression analysis with two different specifications and sample sizes, the analysis finds that meeting the "other" vegetables standard, the total vegetables standard, and the two small combinations of standards all led to significantly higher food costs.

A common argument for why healthier foods would be more expensive is that fresh fruits and vegetables are more costly. The evidence here is supportive of that argument with respect to vegetables, but not so with respect to fruit. However, other costs potentially associated with providing more fruit, such as labor and capital, are not measured here because of data limitations. The results on vegetables suggest that it is the extra kinds and the higher total quantities of vegetables that will raise food costs most. The results also suggest that schools that meet lowfat/fat-free milk standards (separately) will have higher food costs on average. The implication of the bivariate result for the milk standard cost is more surprising. However, the higher costs for milk may be driven by the presence of flavored fat-free milk that is more expensive on average compared to unflavored milk costs across all such milk items purchased by schools in the sample.

Menus that have lower calories and less starchy vegetables will have lower food costs according to this analysis. These standards can help make the case that implementing the totality of standards may not be as costly as expected. These kinds of cost-reducing features have hardly been discussed in the literature, and yet they are the logical result of serving less food overall.

The methodology of estimating cost differences in this study differs from the methodologies of recent studies conducted by the IOM Committee and USDA/FNS. First, the food cost differences compare different kinds of menus; this report compares menus that comply with individual standards or small subsets of the proposed standards rather than ones that comply with all of the standards as the two other studies do. Second, this

analysis does not include the factor of student acceptance, as the two other studies do; this analysis does not examine cost differences between healthy and less healthy meals that were *chosen* by students as done in the other two studies. This study examines only the cost differences between healthy and less healthy meals that were *offered* to students. It is hard to say whether the offered meal should be higher or lower in cost than the one that is selected by students (or "served" as it is often called). It would seem that students would be more likely to reject the healthier parts of the meal that they are less accustomed to eating and that the lunch elements they choose would more closely resemble the status quo. That reasoning suggests that the offered meals would be more expensive for school food providers than the selected meals if indeed the healthier elements are more expensive. On the other hand, the IOM study, which estimates the costs of offered and selected meals, finds that the offered meals meeting the new standards had a *lower* average price than the status quo offered meals, while selected meals meeting the new standards were higher in price than the baseline meal. This could be a function of their smaller sample, but it puts the direction of difference in question.

Labor and capital costs are important parts of the school food budget, and this analysis does not examine how such costs may be affected by the new standards. It is logical to expect both of these costs to be higher in the short term, such as by needing to invest in new kitchen equipment or needing to retrain foodservice workers, but the impact on long-term labor and capital costs is an open question. Data for answering this question are not available at this time, but it is likely that in the short term, the total costs of meeting the standards are higher than the food cost estimates shown here.

An important caveat is that the estimated differences in costs rely on a relatively small sample of schools. This affects the precision of the estimates of food cost differences and the effects of school characteristics on those differences.

Another important caveat is that the food served in schools has changed since 2005. National attention has been focused on the quality of school meals, and many schools have completely changed the kinds of food that they serve. More schools incorporate fresh fruits and vegetables into their meals, and fresh produce is more available through USDA food distribution programs, particularly through their partnership with the Department of Defense's "DoD Fresh" program. "Local wellness" programs that were congressionally mandated in 2004 have also contributed to awareness and change. School food distributors and food management companies have responded by providing more fresh foods. Given the changes that have occurred since 2005, the food cost increases implied by this analysis possibly overstate the cost differences that schools would face in the current environment.

Overall, the results here suggest that implementation of the proposed standards will lead to higher food costs in school lunches. It is impossible to say with precision whether the 6 cent increase in the new legislation is the correct amount since no school implemented even most of the proposed standards. However, by looking at the implied costs of individual standards, the results do show what extra costs may be expected from the different standards. The main sources of higher costs for the different combinations of standards appear to be related to the provision of more, and more diverse, non-starchy vegetables.

References

Bartlett, S., F. Glantz, and C. Logan. 2008. "*School Lunch and Breakfast Cost Study II: Final Report."* Report No. CN-08-MCII, Food and Nutrition Service, U.S. Department of Agriculture, Washington, D.C.

Bowman, S.A., J. Friday, and A. Moshfegh. 2008. "MyPyramid Equivalents Database 2.0 for USDA Survey Foods, 2003–2004." Food Surveys Research Group, Beltsville Human Nutrition Research Center, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, MD.

Campbell, B.L., R.M. Nayga, Jr., J.L. Park, and A. Silva. 2011. "Does the National School Lunch Program Improve Children's Dietary Outcomes?" *American Journal of Agricultural Economics* 93(4): 1099–1130.

Federal Register. 2011. "Nutrition Standards in the National School Lunch and School Breakfast Programs, Proposed Rule." *Federal Register* 76(9): 2494 (January 13).

____. 2012. "Nutrition Standards in the National School Lunch and School Breakfast Programs." *Federal Register* 77(17): 4088 (January 26).

Gleason, P.M., and A.H. Dodd. 2009. "School Breakfast Program But Not School Lunch Program Is Associated with Lower Body Mass Index." *Journal of American Dietetic Association* 109(2): S118–S128.

Gleason, P., and C. Suitor. 2003. "Eating at School: How the National School Lunch Program Affects Children's Diets." *American Journal of Agricultural Economics* 85(4): 1047–1061.

Gordon, A., M.K. Crepinsek, R. Nogales, and E. Condon. 2007. "*School Nutrition Dietary Assessment Study III*. Food and Nutrition Service, U.S. Department of Agriculture, Washington, D.C. Available at http://www.fns.usda.gov/ora/menu/published/cnp/cnp.htm (accessed February 13, 2012).

Hofferth, S., and S. Curtin. 2005. "Poverty, Food Programs, and Childhood Obesity." *Journal of Policy Analysis and Management* 24(4): 703–726.

Institute of Medicine (IOM). 2009. "School Meals: Building Blocks for Healthy Children." Washington, D.C.: The National Academies Press.

IOM [*see* Institute of Medicine].

Lin, B.-H., and S.T. Yen. 2007. "The U.S. Grain Consumption Landscape: Who Eats Grain, in What Form, Where, and How Much?" Economic Research Report No. 50, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

Millimet, D.L., R. Tchernis, and M. Husain. 2009. "School Nutrition Programs and the Incidence of Childhood Obesity." *The Journal of Human Resources* 45(3): 640–654.

Neuberger, Z., and T.F. Namian. 2010. "Who Benefits from Federal Subsidies for Free and Reduced Price School Meals?" Center for Budget and Policy Priorities, Washington, D.C.

Ollinger, M., K. Ralston, and J. Guthrie. 2011. "School Food Service Costs: Does Location Matter?" Economics Research Report No. 177, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

Schanzenbach, D.W. 2009. "Do School Lunches Contribute to Childhood Obesity?" *Journal of Human Resources* 44(3): 685–708.

Todd, J., E. Leibtag, and C. Penberthy. 2011. "Geographic Differences in the Relative Price of Healthy Foods." Economic Information Bulletin (EIB) No. 78, Economic Research Service, U.S. Department of Agriculture, Washington, D.C.

U.S. Department of Agriculture. 2011. "Nutrient Analysis Protocols: How to Analyze Menus for USDA's School Meal Programs." Available at http://www.fns.usda.gov/tn/Resources/nutrientanalysis.html (accessed November 25, 2011).