

The Role of Calorie Content, Menu Items, and Health Beliefs on the School Lunch Perceived  
Health Rating

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Selected Paper prepared for presentation for the 2016 Agricultural & Applied  
Economics Association, Boston, MA, July 31-August 2

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## **Introduction**

Childhood obesity has become a hot button issue in recent years as the prevalence of childhood obesity has increased. To stem this increase, the federal government passed laws to regulate the nutritional content of school lunches. One example is the Healthy, Hunger-Free Kids Act (HHFKA) of 2010. This Act dictates the nutritional content and caloric limits for reimbursable lunches served under the National School Lunch Program and involves several major changes to previous regulation. In particular, while articulating more stringent nutritional requirements, the Act also lowers the permissible average daily calorie content of lunches to the 550-650 calorie range for students in grades K-5 (U.S. Department of Agriculture 2012).

A risk of changing the nutritional content of school lunches is that students may choose to consume foods outside of the regulated lunch options, such as packed lunches or off-campus meals, that may not be as healthy. One study found that 6% of elementary school students and 27% of high school students left the school campus for lunch (O'Toole et al. 2007). If such substitution patterns emerge, students may actually consume food and beverage items worse in nutritional quality compared to those items served as part of regulated school lunches (Hur, Burgess-Champoux, and Reicks 2011). One potential and extreme way to counter this decrease is to prohibit consumption of non-school lunch program meals. Eng and Hood (2011) describe one extreme case where a Chicago school tried this, but parents note that the school lunches may actually be nutritionally worse than the home-packed lunches.

In light of these new regulations, school district officials want to know what drives the health perceptions of parents who decide to purchase school lunches for their children. In turn, these health perceptions influence the school lunch purchase decision (Pham and Roe 2013). However, little is known about how about the factors that drive the health perceptions of a school

lunch post-implementation of the HHFKA of 2010. This study uses a stated preference survey involving parents from a single school district to explore how various factors, including school lunch calorie levels, affect parents' perceptions of school lunch healthfulness.

## **Model**

The household's perceived healthiness of each lunch meal was estimated using an ordered probit model where explanatory variables included perceived importance of healthiness of school lunch food, meal calorie content, lunch item-specific variable items, and importance of health when preparing items at home. The ordered probit model, as explained by McKelvey and Zavoiona (1975), was chosen since the dependent variable, the perceived health rating of the school lunch, could only take on four discrete values, and higher values correspond to higher ratings of perceived health.

The ordered probit took on the functional form:

$$\Pr(y_j = i) = \Pr(\kappa_{i-1} < \beta_1 x_{1j} + \dots + \beta_k x_{kj} + u_j \leq \kappa_i) = \Phi(x_j \beta)$$

where  $i$ ,  $j$ , and  $k$  denote the outcome, or respondent health rating, observation number, and the number of explanatory variables, respectively. A list of dependent and independent variables used in the ordered probit regression is contained in Table 1.

Likelihood ratio tests reveal that preference structures are statistically distinct across income categories, and hence separate models are estimated for the three income strata, less than \$75,000, between \$75,000 and \$150,000, and greater than \$150,000.

## **Methodology**

The survey was answered by 247 parent-respondents from the Upper Arlington, Ohio, an affluent, racially homogeneous suburb of Columbus, Ohio. Respondents answered several questions about the home food environment, beliefs about food consumption at home and away

from home hypothetical weekly lunch menu by providing ratings of an overall perceived healthiness of each day's lunch menu items. Menu items included a mix of 10 presently served main entree items and 5 of each of the following: fruit, vegetable, and side items. The health rating score ranged from 1-4 points on a Likert scale where 1 denotes very unhealthy and 4 denotes very healthy. The respondents also rated the importance of overall lunch health in the school and the importance of food healthiness for food consumption at home. Summary statistics of the survey population is given in Table 2.

## **Results**

Calorie content had a statistically significant influence at the 5% significance level on school lunch health perceptions for the highest income category only. For this income category, the marginal effect of 100 calories on the probability of the health rating of school lunch health at a rank 1 is 0.04. Across all income categories, the main food category that drives the perceived school lunch health rating is the main entree. Eight out of the ten main entree items were statistically significant at the 5 percent level. In all of these cases, these entree items decreased the overall health perception rating of the school lunch.

In contrast, the specific fruit, vegetable, and other food item categories had one or more items that were statistically significant. For these significant items, some increased the perceived health of the school lunch while other decreased the perceived health. The ratings of the importance of healthiness of school lunch food was significant at the 1 percent level for the middle income category, and the importance of health when preparing items at home was statistically significant for the lowest income category at the 1 percent level. The ordered probit regression results are listed in Table 3.

Table 1. Variables Used in Ordered Probit Regression

Variable Name	Variable Choices
Perceived Health Rating of specific lunch choice (4 choices)	Very Unhealthy, Somewhat Unhealthy, Somewhat Healthy, Very Healthy
Main entrée (10 choices)	Baked Chicken Breast (base item), Oven Roasted Sliced Turkey on Whole Grain Bread, Cheeseburger on Whole Grain Bun , Macaroni & Cheese, Bosco Cheese Sticks, Chicken Nuggets, Taco Turkey, Ravioli with Sauce, Mini Corn Dog Bites, Cheese Quesadilla
Vegetable (5 choices)	Baby Carrots (base item), Baked French Fries, Green Bell Pepper Strips, Steamed Broccoli, Tossed Salad
Fruit (5 choices)	Cinnamon Applesauce (base item), Banana, Diced Peaches, Fresh Grapes, Fresh Orange Sections
Other/Dessert (5 choices)	Chocolate Chip Cookie (base item), Dinner Roll, Fruit Flavored Yogurt, Graham Cracker Snack, Pretzel Snack
Calorie Content (5 choices)	550, 575, 600, 625, 650
Importance of overall healthiness of school lunch food (4 choices)	Very Unimportant, Somewhat Unimportant, Somewhat Important, Very Important
Importance of health when preparing meals at home (4 choices)	Very Unimportant, Somewhat Unimportant, Somewhat Important, Very Important

Note: Dependent variable is Perceived Health Rating of specific lunch choice

Table 2. Sample and Upper Arlington City Demographic Summary Statistics

	Total Sample (N=247)	Upper Arlington city-wide average <sup>a</sup>
Household Income		
Less than \$75,000	8.9%	41.9%
\$75,000 to \$150,000	38.1%	32.3%
More than \$150,000	44.9%	25.8%
No Response	8.1%	N/A
% White	90.3%	91%
% Female	90.6%	52.2%
Employment <sup>b</sup>		
2 full time workers	34.9%	15.6%
1 full time worker	63.9%	81.9%
Respondent Education		
Less than four-year college degree	7.8%	32.5%
Four-year college degree	44.5%	37.7%
Greater than four-year college degree	47.7%	29.8%
Spouse/Partner Education		
Less than four-year college degree	7.4%	N/A
Four-year college degree	40.7%	N/A
Greater than four-year college degree	48.2%	N/A
Not Applicable	3.7%	N/A
Most Common Grade Level of Youngest Child	3	N/A

<sup>a</sup>Source: American Community Survey 5-year estimates 2006-2010 (US Census Bureau 2012).

<sup>b</sup>Unemployment figure represents married couples.

Table 3. Ordered Probit Results by Income Group (Dependent Variable: Perceived Health Rating)

Income Category Variable	Less than \$75000			\$75,000 to \$150,000			More than \$150,000		
	Estimate	Std. Error	Wald Statistic <sup>a</sup>	Estimate	Std. Error	Wald Statistic <sup>a</sup>	Estimate	Std. Error	Wald Statistic <sup>a</sup>
Calories	-0.003	0.003	---	-0.001	0.001	---	-0.002**	0.001	---
Main Entrée			85.27***			65.51***			97.96***
Baked Chicken Breast (base)	---	---		---	---		---	---	
Oven Roasted Sliced Turkey on Whole Grain Bread	-0.330	0.451		0.306	0.301		-0.034	0.216	
Cheese Quesadilla	-1.324***	0.345		-0.77***	0.259		-0.912***	0.244	
Cheeseburger on Wheat Bun	-0.978**	0.440		-0.934***	0.289		-0.876***	0.235	
Macaroni & Cheese	-2.030***	0.363		-1.058***	0.255		-1.378***	0.230	
Chicken Nuggets	-1.908***	0.384		-1.060***	0.280		-1.277***	0.236	
Taco Turkey	-0.873**	0.402		-0.393*	0.228		-0.487**	0.202	
Bosco Cheese Sticks	-1.963***	0.471		-1.402***	0.276		-1.487***	0.218	
Ravioli with Sauce	-0.854**	0.384		-0.764***	0.216		-0.727***	0.215	
Mini Corn Dog Bites	-2.784***	0.430		-1.683***	0.318		-1.663***	0.215	
Vegetable			25.39***			40.22***			52.75***
Baby Carrots (base)	---	---		---	---		---	---	
Baked French Fries	-0.848***	0.212		-0.537	0.145		-0.692	0.129	
Green Bell Pepper Strips	-0.159	0.209		0.064	0.134		-0.003	0.132	
Steamed Broccoli	-0.040	0.252		0.405***	0.133		0.222	0.147	
Tossed Salad	-0.139	0.272		0.109	0.149		0.086	0.131	

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Table 3, continued

Income Category Variable	Less than \$75000			\$75,000 to \$150,000			More than \$150,000		
	Estimate	Std. Error	Wald Statistic <sup>a</sup>	Estimate	Std. Error	Wald Statistic <sup>a</sup>	Estimate	Std. Error	Wald Statistic <sup>a</sup>
Fruit			11.43**			5.23			14.01***
Cinnamon Applesauce (base)	---	---		---	---		---	---	
Banana	-0.020	0.240		0.175	0.137		0.291**	0.129	
Diced Peaches	-0.566**	0.222		-0.070	0.162		0.024	0.122	
Fresh Grapes	-0.119	0.248		0.120	0.131		0.161	0.133	
Fresh Orange Sections	-0.408**	0.209		0.169	0.141		0.366***	0.124	
Other			2.95			11.75**			11.60**
Chocolate Chip Cookie (base)	---	---		---	---		---	---	
Dinner Roll	-0.045	0.229		0.369**	0.157		0.159	0.138	
Fruit Flavored Yogurt	0.354	0.267		0.390***	0.145		0.245*	0.134	
Graham Cracker Snack	0.020	0.245		0.371***	0.131		0.189	0.121	
Pretzel Snack	0.080	0.220		0.175	0.129		0.402***	0.121	
School Lunch Healthiness			1.27			10.67**			4.11
Very Unimportant (base)	---	---		---	---		---	---	
Somewhat Unimportant				-1.017**	0.522		1.310*	0.695	
Somewhat Important	-0.493	0.525		-0.823	0.581		1.014*	0.572	
Very Important	-0.572	0.511		-1.491***	0.575		0.871	0.574	
Healthiness of Home Meals			8.34**			5.08*			17.74***
Very Unimportant (base)	---	---		---	---		---	---	
Somewhat Unimportant	---	---		---	---		0.400	0.386	
Somewhat Important	0.742***	0.269		0.923**	0.414		-0.376	0.581	
Very Important	0.308*	0.184		0.545	0.410		-1.030*	0.567	
N	203			443			535		
Pseudo-R <sup>2</sup>	0.2283			0.1834			0.1825		

\*\*\*, \*\*, \*: Parameter estimate significant at 1%, 5%, and 10% significance levels, respectively.

<sup>a</sup>:p-value from a Wald test that all coefficients in this class jointly equal zero



## **Discussion**

To the author's knowledge, this is the first study to explore the relationship between health perceptions of school lunches and health perceptions of school lunch food and foods consumed at home after enactment of the HHFKA. This contributes to a small literature exploring the implications of nutritional changes to school lunches. Overall, the main entrée serves as the main influence in the overall perceived lunch health rating followed by the importance of health for home-prepared meals.

A related work includes Wojcicki and Heyman (2006) who found that 50 percent of students at a school in the San Francisco Unified School District perceived the school cafeteria lunches to offer more fresh vegetables and fruits compared to what was offered in the previous school year. However, none of the extant literature explores changes to total meal calorie content as dictated by the HHFKA of 2010. This may be crucial since school foodservice programs need to serve lunches that conform to federal laws while ensuring that the lunches do not drive students to non-healthy food sources.

## **Conclusion**

This study explored the relationship between lunch item-specific health ratings and other health perception variables. Respondents' perceptions of the healthiness of the main entrée serves as the main influence of the overall lunch health rating followed by the importance of health for home-prepared meals.

An open question is whether one may extrapolate the lunch menu results from this survey to other school districts around the country whose household demographics and lunch policies are different from those of the Upper Arlington school district. School district officials and

policymakers must exercise caution when comparing perceived lunch healthfulness across school districts with different student and parent demographic backgrounds since different people will exhibit different perceptions of school lunch healthiness based on different respondent demographic background.

## References

- Eng, M. and J. Hood. 2011. "Chicago School Bans some Lunches Brought from Home."  
*Chicago Tribune*, April 11.
- Hur, I., T. Burgess-Champoux and M. Reicks. 2011. "Higher Quality Intake From School Lunch Meals Compared With Bagged Lunches." *ICAN: Infant, Child, & Adolescent Nutrition* 3(2):70-75.
- McKelvey and W. Zavoina. 2011. "A Statistical Model for the Analysis of Ordinal Level Dependent Variables." *Journal of Mathematical Sociology* 4:103.
- O'Toole, T. P., S. Anderson, C. Miller and J. Guthrie. 2007. "Nutrition Services and Foods and Beverages Available at School: Results From the School Health Policies and Programs Study 2006." *Journal of School Health* 77(8):500-521.
- Pham and Roe 2013. "Will Reducing the Calorie Content of School Lunches Affect Participation? Evidence from a Hypothetical Choice Experiment with Suburban Parents" *In Progress*.
- U.S. Census Bureau. 2012. "American Community Survey 5 Year Estimates 2006-2010." Available at <http://www.census.gov> (accessed June 1, 2012).
- U.S. Department of Agriculture, Office of Public Affairs. 2012. *National School Lunch Program Fact Sheet*. Available online at:  
<http://www.fns.usda.gov/sites/default/files/NSLPFactSheet.pdf>, accessed April 22, 2014.
- Wojcicki, J. M., and M. B. Heyman. 2006. Healthier choices and increased participation in a middle school lunch program: Effects of nutrition policy changes in San Francisco.  
*American Journal of Public Health*