The Effect of School Food Programs on Childhood Obesity

Yongwon Cho and Bidisha Mandal

School of Economic Science
Washington State University, Pullman, WA
yongwon_cho@wsu.edu

Poster prepared for presentation at the Agricultural & Applied Economic Association's 2012 AAEA Annual Meeting, Seattle, Washington, August 12-14, 2012

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WASHINGTON STATE UNIVERSITY
World Class. Face to Face.

Introduction

• **Childhood obesity problem** raises new social issue in developed countries by changing societal attitudes

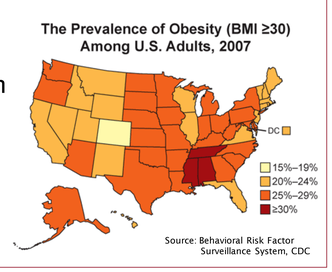
• **National School Lunch Program (NSLP)** can be effective policy tool to control childhood obesity

• We Investigate effects of enrollment in NSLP on student's BMI

• We set up a **student's utility maximization problem** to choose food between school lunch or outside restaurants

• We focus on **twin students in ECLS-K data** to control identification problems

- Nationwide longitudinal study from kindergarten to 8th grade, 15000 students in 100 different schools



Individual Effects
• Metabolism, Exercise
• Race, Age, Gender
• Appearance

Family Effects
• Family Income
• Employment status
• Parent's Education level

Food Consumption
• At home, restaurant
• School Food Programs
- School Breakfast Program
- National School Lunch Program

Student's Body Mass Index (BMI)*

Obese / Overweight | Normal

• Independent variables

* : Do not consider underweight

Results

Theoretical Model: Student's Utility Maximization Problem

$$Max_{\{q_{\tau i}\}} U = U(Z, H, BMI)$$

s.t. $Z = Z(q_{\tau i}; c_\tau)$, $H = \overline{H}$, $BMI = \delta(Z + H) - CO$

where Z, H are food consumption in school and home, respectively

CO is total amount of calories-out, c_τ is exogenous calories

$q_{\tau i}$ is frequency of τ types of food, δ is given metabolism rate

$i = 1(NSLP), 0(\text{otherwise})$

$$\frac{dBMI^*}{dq^*_{\tau 1}} = \delta\left[\frac{\partial Z}{\partial q^*_{\tau 1}} + \frac{\partial Z}{\partial q^*_{\tau 0}}\frac{\partial q^*_{\tau 0}}{\partial q^*_{\tau 1}}\right]$$

Only if $\frac{\partial Z}{\partial q^*_{\tau 1}} > \frac{\partial Z}{\partial q^*_{\tau 0}}$, the $NSLP$ affects positively to reduce obesity.

Ordinary Least Square (OLS) Result for Entire Students

	Overall	Obese
Dependent variable is BMI_t	N=5584	N=606
BMI_{t-1}	.992 (.016)***	.967 (.054)***
Calorie-in	.041 (.018)**	.118 (.111)
Exercise	.026 (.021)	.308 (.166)*
Trying to lose weight	.729 (.116)***	-.968 (1.21)
Buying frequency in school	.091 (.023)***	.596 (.261)**
Participating NSLP	.449 (.113)***	-.047 (.645)
Initial weight	.049 (.021)**	.225 (.116)*
Parent's education	.018 (.009)*	.133 (.077)*

OLS, Generalized Estimation Equation (GEE) Result for Twins

	OLS	GEE
Dependent variable is ΔBMI_t	N=84	N=168
BMI_{t-1}	.418 (.161)***	.768 (.064)***
Calorie-in	.080 (.268)	.682 (.187)***
Exercise	.019 (.314)	-
Trying to lose weight	.386 (.516)	-
Buying frequency in school	.311 (.324)	.538 (.210)***
Participating NSLP	-	2.81 (1.39)**
Initial weight	.580 (.602)	.464 (.237)***

Why Twins?

• Control environmental, biological unobservable variables
- Family characteristics, innate ability

• Eliminate any absolute ability bias in BMI difference

Key Findings

• NSLP effect on student's BMI is determined by size of marginal product of NSLP and outside restaurant

• BMI determinants of obese students are **different** to normal students so that policy should be **differentiated**

• **Total amount of calorie**, **buying frequency from vending machine in school** affect to increase twin's BMI difference

Policy Implications

• **Reduce number of vending machines in school**

• **Provide low calorie foods to both NSLP and vending machine**

TO WIN, WE HAVE TO LOSE