The Effect of School Food Programs on Childhood Obesity

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The Effect of School Lunch Program on Childhood Obesity

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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

Theoretical Model: Student’s Utility Maximization Problem

$$\max_{i} U = U(Z, H, BMI)$$

s.t. 
$$Z = Z(q_i, e_i), \ H = \bar{T}, \ BMI = \delta(Z + H) - CO$$

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

$$CO$$ is total amount of calories-out, $$e_i$$ is exogenous calories

$$q_i$$ is frequency of $$\tau$$ types of food, $$\delta$$ is given metabolism rate

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

$$\frac{dBMI}{dq_{i1}} = \frac{\partial Z}{\partial q_{i1}} + \frac{\partial Z}{\partial q_{i2}} \cdot \frac{\partial q_{i2}}{\partial q_{i1}}$$

Only if $$\frac{\partial Z}{\partial q_{i2}} > \frac{\partial Z}{\partial q_{i1}}$$, the NSLP affects positively to reduce obesity.

Ordinary Least Square (OLS) Result for Entire Students

<table>
<thead>
<tr>
<th>Dependent variable is BMI*</th>
<th>Overall</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=5584</td>
<td>N=606</td>
<td></td>
</tr>
<tr>
<td>BMI t-1</td>
<td>.992 (.016)***</td>
<td>.967 (.054)***</td>
</tr>
<tr>
<td>Calorie-in</td>
<td>.041 (.018)**</td>
<td>.118 (.111)</td>
</tr>
<tr>
<td>Exercise</td>
<td>.026 (.021)</td>
<td>.308 (.166)*</td>
</tr>
<tr>
<td>Trying to lose weight</td>
<td>.729 (.116)***</td>
<td>-.968 (1.21)</td>
</tr>
<tr>
<td>Buying frequency in school</td>
<td>.091 (.023)***</td>
<td>.596 (.261)**</td>
</tr>
<tr>
<td>Participating NSLP</td>
<td>.449 (.113)***</td>
<td>-.047 (.645)</td>
</tr>
<tr>
<td>Initial weight</td>
<td>.049 (.021)**</td>
<td>.225 (.116)*</td>
</tr>
<tr>
<td>Parent’s education</td>
<td>.018 (.009)**</td>
<td>.133 (.077)*</td>
</tr>
</tbody>
</table>

OLS, Generalized Estimation Equation (GEE) Result for Twins

<table>
<thead>
<tr>
<th>Dependent variable is ΔBMI*</th>
<th>OLS</th>
<th>GEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=84</td>
<td>N=168</td>
<td></td>
</tr>
<tr>
<td>BMI t-1</td>
<td>.418 (.161)***</td>
<td>.768 (.064)***</td>
</tr>
<tr>
<td>Calorie-in</td>
<td>.080 (.268)</td>
<td>.682 (.187)***</td>
</tr>
<tr>
<td>Exercise</td>
<td>.019 (.314)</td>
<td>-</td>
</tr>
<tr>
<td>Trying to lose weight</td>
<td>.386 (.516)</td>
<td>-</td>
</tr>
<tr>
<td>Buying frequency in school</td>
<td>.311 (.324)***</td>
<td>.538 (.210)***</td>
</tr>
<tr>
<td>Participating NSLP</td>
<td>-</td>
<td>2.81 (1.39)**</td>
</tr>
<tr>
<td>Initial weight</td>
<td>.580 (.602)</td>
<td>.464 (.237)**</td>
</tr>
</tbody>
</table>

Policy Implications

• Reduce number of vending machines in school
• Provide low calorie foods to both NSLP and vending machine

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

Student’s Body Mass Index (BMI)*

Obese / Overweight

• Independent variables

* : Do not consider underweight

Food Consumption

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

Family Effects

• Family Income
• Employment status
• Parent’s Education level

Individual Effects

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

Results


Source: Behavioral Risk Factor Surveillance System, CDC

Introduction

Why Twins?

Key Findings

Policy Implications

TO WIN, WE HAVE TO LOSE