Food Policy, Economics and Obesity Prevention

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The health risks associated with obesity are numerous and include:

- premature death
- type 2 diabetes
- heart disease
- stroke
- hypertension
- gallbladder disease
- osteoarthritis
- sleep apnea
- asthma
- breathing problems
- cancer
- high blood cholesterol
- complications of pregnancy
- menstrual irregularities
- hirsutism
- stress
- incontinence
- depression
## Background: Obesity Rates

### Children (2-19):

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>15.5%</td>
<td>17.1%</td>
</tr>
<tr>
<td>African American</td>
<td>13.6%</td>
<td>24.1%</td>
</tr>
</tbody>
</table>

### Adults (20+):

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>33.2%</td>
<td>31.1%</td>
</tr>
<tr>
<td>African American</td>
<td>30.2%</td>
<td>53.9%</td>
</tr>
</tbody>
</table>

Economic Models

- Idea is that the policy instrument changes relative costs or benefits which, in turn, affect behavior choices related to diet and activity.

- Equity considerations: i.e., food taxes - who benefits versus who bears the costs.
  - Health benefits – progressive
  - Tax burden – regressive
  - Subsidies – progressive
Food Accessibility, Availability, and Affordability

**Access**: Total Cost based on Availability *and* Affordability

**Availability**: Number of available food-related outlets within a measured geographic area assessed on a per capita and/or per land area basis.

- Healthy foods associated with grocery store and supermarket availability.
- Less healthy foods associated with convenience store and fast food restaurant availability.

**Affordability**: Monetary cost → food prices.

- Affordability of healthy foods proxied by fruit and vegetable prices.
- Affordability of less healthy foods proxied by fast food and soda prices.
Evidence

Some examples relevant for the following food-related policy instruments:

- Taxes
- Subsidies
- Advertising Regulations
- Zoning
- Urban Planning
Fruit and Vegetable Price Index, 1990-2007

Note: Fruit and Vegetable Price Index includes: potatoes, bananas, iceberg tomatoes, sweet peas & peaches.
Dairy Prices and Meat Price Index, 1990-2007

Note: Meat Price Index includes: T-bone steak, ground beef, sausage, frying chicken, and chunk light tuna.
Soft Drink Price Index, 1990-2007

Fast Food Price Index, 1990-2007

Note: Fast Food Price Index includes: hamburger 1/4-pound with cheese, 11”-12” thin crust cheese pizza, and fried chicken-thigh and drumstick.
Zip Codes Without Grocery Stores or Supermarkets and Without Chain Supermarkets

Urban Zip Codes Without Grocery Stores or Supermarkets and Without Chain Supermarkets

Grocery store and Supermarket Availability by Zip Code per 10,000 Capita


Outlet Availability per 10,000 Capita
(by zero availability and quartiles of non-zero outlet availability)

- Red: 0
- Yellow: 3.01 - 5.01
- Blue: 7.01 or more
- Teal: 5.01 - 7.01

0.20-3.01
Grocer Store and Supermarket Availability by Zip Code per 10,000 Capita per 10 Square Miles

Outlet Availability per 10,000 Capita per 10 square miles
(by zero availability and quartiles of non-zero outlet availability)

- Red: 0
- Yellow: 0.41 - 1.00
- Light Blue: 1.01 - 3.00
- Dark Blue: 3.01 or more

Food Store and Restaurant Availability by Demographics and Socio-economic Status

Business List Data
- Dun & Bradstreet year 2000 data on food stores (grocery stores, chain supermarkets, non-chain supermarkets and convenience stores).

Linked across 28,050 zip codes to:

Census 2000 Data
- Census data on population characteristics
  - race, ethnicity, income, population, and urbanicity
Availability of Food Store Outlets, by Race

Incidence Rate Ratios

<table>
<thead>
<tr>
<th>Availability of Food Store Outlets, by Race</th>
<th>White</th>
<th>African American</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain Supermarkets</td>
<td>1</td>
<td>0.52</td>
</tr>
<tr>
<td>Non-chain Supermarkets</td>
<td>1</td>
<td>1.49</td>
</tr>
<tr>
<td>Grocery Stores</td>
<td>1</td>
<td>1.69</td>
</tr>
<tr>
<td>Convenience Stores</td>
<td>1</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Source: Powell et al., Preventive Medicine, 2007.
Availability of Food Store Outlets, by Ethnicity

Source: Powell et al., Preventive Medicine, 2007.
Availability of Food Store Outlets, by Income

Source: Powell et al., Preventive Medicine, 2007.
Availability of Fast Food Restaurants, by Race

Incidence Rate Ratios

Availability of Fast Food Restaurants, by Ethnicity

Availability of Fast Food Restaurants, by Income

Incidence Rate Ratios

Fast-food Restaurants

Availability of Fast Food Restaurants, by Income

Low Near low Middle Near high High

Summary of Food Environment and Community Characteristics

• Fewer large chain supermarkets in lower income communities and substantially fewer in predominantly African American and Hispanic communities.

• Smaller groceries, independent supermarkets more available in minority communities.

• Find greater availability of fast food restaurants in low-to middle income neighborhoods.

• Fewer restaurants of all types in predominantly minority communities.

• Of restaurants available, significantly higher proportion of fast food restaurants in African American communities.
Community Food Environment and Child/Youth Weight Outcomes: Data Linkage

Individual-level data examples
- Monitoring the Future Data
- Child Development Supplement of the PSID
- Children of the National Longitudinal Survey of Youth ‘79

Linked by geocodes to:
- **Food prices from ACCRA**
  - *Fruit and vegetable price index*
  - *Fast food price index*
- **Outlet density data from D&B**
  - *Fast Food and Full-service Restaurants*
  - *Supermarkets, Grocery and Convenience Stores*
- **Census Data**
Evidence from MTF: Community Food Environment and Youth Fruit and Vegetable Consumption and BMI

• Find that:

  • Youth in communities with lower fruit and vegetable prices have more frequent fruit & vegetable consumption and lower BMI

  • Youth in communities with lower fast food prices have less frequent fruit & vegetable consumption, higher BMI, and are more likely to be overweight

    • 10 percent rise in fast food prices would increase probability of frequent F&V consumption by 3%, reduce BMI by 0.4% and lower probability of being overweight by 5.9%

Source: Powell, et al., Advances in Health Economics and Health Services Research, 2007
Evidence from MTF: Community Food Environment and Youth BMI

• Find that:
  • Impact of both fast food and fruit & vegetable prices greatest among youth in top of BMI distribution (most at risk group)
    • Above 90th percentile, fast food price impact 4 times larger than average effect for full sample
    • Above 95th percentile, fruit & vegetable price impact 5 times larger than average effect
  • Little impact of prices at low/mid-ranges of BMI
  • Supermarket availability inversely associated with BMI at all levels, with greater impact on upper end

Source: Auld and Powell, *Economica*, in press
Evidence from MTF: Community Food Environment and Youth Physical Activity

• Find that:
  • Increased availability of commercial physical activity-related facilities is associated with a small increase in vigorous exercise
    • An additional facility per 10,000 capita associated with a 0.22 percentage point increase in frequent vigorous exercise.
    • Effects greatest among female and older youths.

Source: Powell et al., American Journal of Preventive Medicine, 2007
Evidence from CDS-PSID: Contextual Factors on Child BMI Percentile by Family Income

<table>
<thead>
<tr>
<th>Dependent Variable: BMI Percentile</th>
<th>Low Income Families (Income Quintiles 1 &amp; 2)</th>
<th>High Income Families (Income Quintiles 4 &amp; 5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price of Fruit &amp; Veg.</td>
<td>24.0650*</td>
<td>50.9861**</td>
</tr>
<tr>
<td>Price of Fast Food</td>
<td>-18.2990***</td>
<td>-6.0993</td>
</tr>
<tr>
<td>Fast Food Rest.</td>
<td>-0.345</td>
<td>0.0242</td>
</tr>
<tr>
<td>Non-fast Food Rest.</td>
<td>0.0533</td>
<td>-0.0486</td>
</tr>
<tr>
<td>Supermarket Stores</td>
<td>-0.5748**</td>
<td>-0.4598**</td>
</tr>
<tr>
<td>Convenience Stores</td>
<td>-0.2212</td>
<td>0.7869*</td>
</tr>
<tr>
<td>Grocery Stores</td>
<td>-0.0024</td>
<td>-0.021</td>
</tr>
</tbody>
</table>

Evidence from CDS-PSID: BMI Food Price Elasticities by SES

<table>
<thead>
<tr>
<th>Dependent Variable: BMI Percentile Among Children</th>
<th>Cross-sectional Estimates</th>
<th>Longitudinal Fixed Effects Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Low Income</td>
</tr>
<tr>
<td>Price of Fruits &amp; Vegetables</td>
<td>0.24***</td>
<td>0.27*</td>
</tr>
<tr>
<td>Price of Fast Food</td>
<td>-0.16</td>
<td>-0.77***</td>
</tr>
</tbody>
</table>

Evidence from NLSY79: Associations of Food Prices and Outlet Densities on Child BMI

<table>
<thead>
<tr>
<th></th>
<th>Model 1: Outlet Densities per 10,000 Capita</th>
<th>Model 2: Outlet Densities per 10 Square Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price of Fruit and Vegetables</td>
<td>2.0143*</td>
<td>2.3823*</td>
</tr>
<tr>
<td>Price of Fast Food</td>
<td>-0.5068</td>
<td>-0.5033</td>
</tr>
<tr>
<td>Fast Food Restaurants</td>
<td>-0.1701</td>
<td>0.0190</td>
</tr>
<tr>
<td>Full-service Restaurants</td>
<td>-0.0084</td>
<td>-0.0002</td>
</tr>
<tr>
<td>Supermarkets</td>
<td>0.1329</td>
<td>-0.1928*</td>
</tr>
<tr>
<td>Convenience Stores</td>
<td>0.1349</td>
<td>-0.0656</td>
</tr>
<tr>
<td>Grocery Stores</td>
<td>-0.0678</td>
<td>0.0171</td>
</tr>
</tbody>
</table>

Regression coefficients from random effects model. * Denotes statistical significance with p-value ≤ 0.05

Source: Powell and Bao, *Economics of Human Biology*, 2009
Evidence from NLSY79: Price Elasticities of Child BMI by SES

<table>
<thead>
<tr>
<th></th>
<th>Fruit and Vegetable Price Elasticity of BMI</th>
<th>Fast Food Price Elasticity of BMI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full Sample</strong></td>
<td>0.0725*</td>
<td>-0.0667</td>
</tr>
<tr>
<td><strong>By Family Income Quintile</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Income</td>
<td>0.1357*</td>
<td>-0.2565*</td>
</tr>
<tr>
<td>Near-low Income</td>
<td>0.0273</td>
<td>-0.0434</td>
</tr>
<tr>
<td>Middle Income</td>
<td>0.0837</td>
<td>-0.1544</td>
</tr>
<tr>
<td>Near-high Income</td>
<td>0.0564</td>
<td>-0.0629</td>
</tr>
<tr>
<td>High Income</td>
<td>-0.0042</td>
<td>0.2036</td>
</tr>
<tr>
<td><strong>By Mother’s Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother At Most High School</td>
<td>0.0927*</td>
<td>-0.1325*</td>
</tr>
<tr>
<td>Mother College or Above</td>
<td>0.0436</td>
<td>0.0234</td>
</tr>
</tbody>
</table>

* Denotes statistical significance with p-value ≤ 0.05

Source: Powell and Bao, *Economics of Human Biology*, 2009
Studies suggest that fiscal food pricing policies are likely to have modest but measurable effects, on average, on the weight outcomes of children and youths.

Greater price sensitivity among:
- Low-income children
- Children with lower educated mothers
- Youths who are in the upper tail of the BMI distribution

The evidence suggests a multi-pronged approach of changing relative prices by simultaneously subsidizing fruits and vegetables and taxing fast food to improve weight outcomes among adolescents and low-SES children.

Improving access to supermarkets found to be important among low-SES children.
Evidence: Food Product Advertising: 2-11

Source: Powell et al., *Archives of Pediatrics and Adolescent Medicine*, 2007
Food Product Advertising: 12-17

- Fast Food: 23%
- Cereal: 12%
- Candy: 7%
- Soft Drink: 6%
- Candy Bar: 6%
- Restaurant: 6%
- Chewing Gum: 5%
- Fruit Drinks: 3%
- Snacks: 3%
- Isotonic Drinks: 3%
- Yogurt: 2%
- Others: 24%

Source: Powell et al., American Journal of Preventive Medicine, 2007
## Evidence: Nutritional Content of Food Products Viewed on TV By Children Aged 2-11

<table>
<thead>
<tr>
<th></th>
<th>All foods (100%)</th>
<th>Cereal (33.3%)</th>
<th>Sweets (22.7%)</th>
<th>Snacks (13.9%)</th>
<th>Drinks (9.6%)</th>
<th>Other (20.4%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Fat</td>
<td>17.1%</td>
<td>0.0%</td>
<td>41.6%</td>
<td>36.0%</td>
<td>0.0%</td>
<td>13.0%</td>
</tr>
<tr>
<td>High Sat Fat</td>
<td>21.2%</td>
<td>0.0%</td>
<td>47.4%</td>
<td>25.0%</td>
<td>3.2%</td>
<td>33.1%</td>
</tr>
<tr>
<td>High Sugar</td>
<td>80.7%</td>
<td>97.6%</td>
<td>88.6%</td>
<td>65.4%</td>
<td>99.5%</td>
<td>44.9%</td>
</tr>
<tr>
<td>High Sodium</td>
<td>12.3%</td>
<td>2.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>57.8%</td>
</tr>
<tr>
<td>Low Fiber</td>
<td>81.6%</td>
<td>78.6%</td>
<td>82.2%</td>
<td>98.0%</td>
<td>99.9%</td>
<td>65.0%</td>
</tr>
<tr>
<td>Either High Fat/Sugar/Sodium</td>
<td>97.8%</td>
<td>97.6%</td>
<td>96.3%</td>
<td>96.7%</td>
<td>99.5%</td>
<td>99.6%</td>
</tr>
</tbody>
</table>

Source: Powell et al., *Pediatrics*, 2007
Examples of Potential Food-related Policy Instruments

- Taxes
- Subsidies
- Advertising Regulations
- Zoning
- Urban Planning
- Education
- School Food Service Policies
State Sales Tax Rates on Soda
(as of January 1, 2009)

Source: Bridging the Gap Program, Health Policy Center, University of Illinois at Chicago, 2009. Data based on information compiled by The MayaTech Corporation. In addition to sales taxes, the following states currently apply excise taxes to bottles, syrups, and/or powders/mixes at the manufacturer, distributor, or retail level: AL, AR, RI, TN, VA, WA, and WV.
States With Sales Taxes on Sodas and Snack Foods

Number of states with higher sales tax than food generally by product and sales location, 2007

<table>
<thead>
<tr>
<th>Category</th>
<th>Vending</th>
<th>Grocery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chips/Pretzels</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>Milkshakes/Baked</td>
<td>21</td>
<td>0</td>
</tr>
<tr>
<td>Goods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ice Cream</td>
<td>23</td>
<td>4</td>
</tr>
<tr>
<td>Gum</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td>Candy</td>
<td>26</td>
<td>16</td>
</tr>
<tr>
<td>Sodas</td>
<td>28</td>
<td>20</td>
</tr>
</tbody>
</table>

State Sales Tax Rates for Sodas and Snack Foods

Project Overview

The overall goals of this integrated project are: 1) to provide a comprehensive empirical examination of the influences of economic, lifestyle, and social factors on obesity by combining detailed individual-level survey data with regional economic and environmental information on food and fast food prices, local area food store, eating places and physical activity-related outlet density measures, and area crime data and, 2) to provide an extensive outreach program that will use the findings from our research to inform both policy makers and households of which policies, programs, and practices are effective at combating obesity.

read more
ImpacTeen
http://www.impacteen.org

Economic, Lifestyle and Social Influences on Obesity
http://www.impacteen.org/obesity

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