Food and Beverage Pricing: Implications for Public Policy

Department of Public Health
City of Philadelphia
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Lisa M. Powell, PhD
Institute for Health Research and Policy
University of Illinois at Chicago
Presentation Outline

• Pricing Trends
• Prices and Consumption
• Prices and Weight Outcomes
• Soda Taxes and Consumption and Weight Outcomes
• Policy Implications
Trends in Food and Beverage Prices
Selected Food Price Trends, 1980-2010
Inflation Adjusted

Selected Food Price Trends, 1980-2010
Inflation Adjusted

Selected Food Price Trends, 1980-2010
Inflation Adjusted

Selected Food Price Trends, 1980-2010
Inflation Adjusted

Prices and Consumption
A recent review of studies on the impact of food and beverage prices on consumption of various products; estimates suggest 10% own-price increase would reduce:

- Cereal consumption by 5.2%
- Fruit consumption by 7.0%
- Vegetable consumption by 5.9%
- Soft drink consumption by 7.8%
- Sweets consumption by 3.5%
- Food away from home consumption by 8.1%


**bridging the gap**
USDA study on SSB and other beverage consumption estimates that a 10% price increase in SSB prices would result in the following changes in consumption:

**Own-price effect:**
- SSBs: -12.6%

**Cross-price effects:**
- Diet beverages: -4.6%
- Skim milk: +2.0%
- Low-fat milk: +1.2%
- Whole milk: +2.2%
- Juices: +5.6%
- Coffee/tea: -3.8%
- Bottled water: +7.5%

Food Prices: Consumption & Weight Outcomes
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

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, 2009
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: 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

**bridging the gap** Source: Powell and Bao, *Economics of Human Biology*, 2009
Evidence from NLSY97: Fast Food Price BMI Elasticities: Individual-level Fixed Effects Model for Youths

<table>
<thead>
<tr>
<th>Fast Food Price Elasticity of BMI</th>
<th>All</th>
<th>By Parental Income</th>
<th>By Mother’s Education</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Full Sample</td>
<td>Low Income</td>
<td>Middle Income</td>
</tr>
<tr>
<td>Price of Fast Food</td>
<td>-0.0782**</td>
<td>0.0658</td>
<td>-0.3130***</td>
</tr>
</tbody>
</table>

Summary of Associations with Child and Youth BMI

• Studies suggests 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.

bridging the gap
Soda Taxes: Consumption and Weight Outcomes
Objectives, Data and Models
Tax Data

• State level soda taxes from Bridging the Gap (BTG)
• Linked by state FIPS codes and year
• Measures used:
  • State-level soda tax rate
  • Categorical indicators for state-level soda tax rates:
    a. Zero tax
    b. $0 < \text{soda tax rate} \leq 4\%$
    c. $4\% < \text{soda tax rate} \leq 5\%$
    d. $5\% < \text{soda tax rate} \leq 6\%$
    e. Soda tax rate > 6\%
• Disfavored tax rate (soda tax rate – general food tax rate)
• Disfavored dichotomous indicator (indicator if disfavored tax rate > 0)
Soda Taxes, Children’s Consumption, and Weight
Early Childhood Longitudinal Study-Kindergarten Cohort
**Objective**

- To examine association between soda taxes, consumption and weight of children

**Data Description**

- Nationally representative panel of elementary school students.
- Food consumption 5th grade; measured height and weight
- Final sample: 7,414 children who reported their food consumption and 7,300 children for which height and weight information exists
- **Outcome variables**: soda consumption in last week (m=6), soda purchases at school (m=0.4), and weight change 3rd to 5th grade (m=1.9)
- **Control variables**: age in months, race/ethnicity, family income, mother’s education level, physical activity, TV watching, parent-child interactions.
## Associations by Sub-populations

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>Total Consumption</th>
<th>School Consumption</th>
<th>BMI Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Higher Soda Tax Amount</td>
<td>Higher Soda Tax Indicator</td>
<td>Higher Soda Tax Amount</td>
</tr>
<tr>
<td>Full Sample</td>
<td>-0.004</td>
<td>-0.006</td>
<td>-0.010</td>
</tr>
<tr>
<td>At Risk of Overweight</td>
<td>-0.026</td>
<td>-0.078</td>
<td>-0.011</td>
</tr>
<tr>
<td>Low-Income</td>
<td>-0.142*</td>
<td>-0.811</td>
<td>-0.039**</td>
</tr>
<tr>
<td>African American</td>
<td>-0.125</td>
<td>-0.767</td>
<td>-0.103**</td>
</tr>
<tr>
<td>9+ Hrs TV</td>
<td>-0.073</td>
<td>-0.376</td>
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Source: Sturm, Powell, Chriqui, and Chaloupka, *Health Affairs*, 2010
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Source: Sturm, Powell, Chriqui, and Chaloupka, *Health Affairs*, 2010
Policy Simulation Example: Children’s BMI

- Assuming a constant elasticity, an 18% differential soda tax would correspond to a -0.23 BMI units in the change in BMI between 3rd and 5th grade, or a 20% reduction in the excess BMI gain.
Soda Taxes and Adolescents’ Weight
Monitoring the Future
Objective

• To examine association of soda taxes with youths’ BMI

Data Description

• Cross-section individual-level data for 8th, 10th, and 12th grade students, 1997-2006
• Estimation sample includes 153,673 observations
• **Outcome variable**: body mass index (BMI)
• **Control variables**: gender, age, grade, race, ethnicity, student’s hours work and income, parents’ education, work, marital status
• **Neighborhood controls**: Food store and restaurant availability and per capita income
### Associations between Taxes and BMI: Full Sample and by Sub-populations

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full Model</strong></td>
<td>0.0131</td>
<td>0.0638</td>
<td>0.0735</td>
<td>0.0124</td>
<td>0.0110</td>
<td>0.0514</td>
</tr>
<tr>
<td><strong>By Weight Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At Risk of Overweight</td>
<td>-0.0058</td>
<td>-0.0252</td>
<td>-0.0337</td>
<td>-0.0054</td>
<td><strong>-0.0060</strong></td>
<td>-0.0210</td>
</tr>
<tr>
<td>Not at Risk</td>
<td>0.0165</td>
<td>0.0809</td>
<td>0.0993</td>
<td>0.0166</td>
<td>0.0142</td>
<td>0.0665</td>
</tr>
<tr>
<td><strong>By Grade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8(^{th}) Grade</td>
<td>0.0031</td>
<td>0.0429</td>
<td>0.0373</td>
<td>0.0043</td>
<td>0.0070</td>
<td>0.0590</td>
</tr>
<tr>
<td>10(^{th}) Grade</td>
<td>0.0241</td>
<td>0.0997</td>
<td>0.1117</td>
<td>0.0212</td>
<td>0.0216</td>
<td>0.0873</td>
</tr>
<tr>
<td>12(^{th}) Grade</td>
<td>0.0075</td>
<td>0.0400</td>
<td>0.0342</td>
<td>0.0043</td>
<td>-0.0101</td>
<td>-0.0478</td>
</tr>
<tr>
<td><strong>By Parents’ Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some College</td>
<td>0.0160</td>
<td>0.0948</td>
<td>0.0985</td>
<td>0.0156</td>
<td>0.0146</td>
<td>0.0845</td>
</tr>
<tr>
<td>Less than College</td>
<td>0.0067</td>
<td>-0.0134</td>
<td>0.0003</td>
<td>0.0033</td>
<td>0.0017</td>
<td>-0.0354</td>
</tr>
</tbody>
</table>

Policy Implications
Policy Landscape - Subsidies

Food in the U.S. is subsidized for low-income individuals and families through a number of programs such as Food Stamps, the Women, Infant and Children Nutrition Program, the Child and Adult Care Food Program, and the National School Lunch and Breakfast Programs.

Recently, food subsidies are directed at the consumer for fruits and vegetables through the WIC program.

California “Healthy Purchase” pilot program where for each dollar of food stamps spent on fresh produce, participants are subsidized a portion of the cost.
Policy Landscape - Taxes

Food taxes have not generally been introduced with the aim of modifying consumption behavior as they have been used in other public health areas such as tobacco.

Food taxes are currently imposed on selected categories of food such as soft drinks, candy and snacks in grocery stores and vending machines but at quite low tax rates.

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Sales Taxes on Selected Beverages, All States (as of July 1, 2010)

Note: Three states also impose a mandatory statewide local tax that is not reflected in the above data: CA (1%), UT (1.25%), VA (1%).

Source: Bridging the Gap Program, Health Policy Center, University of Illinois at Chicago, 2010
Sales Taxes on Selected Beverages, **Taxing States** (as of July 1, 2010)

Note: Three states also impose a mandatory statewide local tax that is not reflected in the above data: CA (1%), UT (1.25%), VA (1%).

Source: Bridging the Gap Program, Health Policy Center, University of Illinois at Chicago, 2010
Sales taxes applied to vending machines sales, selected beverages (as of July 1, 2010)

<table>
<thead>
<tr>
<th>Beverage Description</th>
<th>Mean all states (%)</th>
<th>Max (%)</th>
<th>N</th>
<th>Mean taxing states (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soda</td>
<td>4.14</td>
<td>8.00</td>
<td>40</td>
<td>5.28</td>
</tr>
<tr>
<td>Diet Soda</td>
<td>4.14</td>
<td>8.00</td>
<td>40</td>
<td>5.28</td>
</tr>
<tr>
<td>≤ 50% fruit juice</td>
<td>4.02</td>
<td>8.00</td>
<td>39</td>
<td>5.26</td>
</tr>
<tr>
<td>Isotonic beverages</td>
<td>4.02</td>
<td>8.00</td>
<td>39</td>
<td>5.26</td>
</tr>
<tr>
<td>Sweetened teas (bottle/can)</td>
<td>3.90</td>
<td>8.00</td>
<td>38</td>
<td>5.24</td>
</tr>
<tr>
<td>Bottled water</td>
<td>3.38</td>
<td>8.00</td>
<td>34</td>
<td>5.07</td>
</tr>
<tr>
<td>&gt;51% fruit juice, but &lt; 100% fruit juice</td>
<td>3.30</td>
<td>8.00</td>
<td>33</td>
<td>5.10</td>
</tr>
<tr>
<td>100% fruit juice</td>
<td>3.30</td>
<td>8.00</td>
<td>33</td>
<td>5.10</td>
</tr>
</tbody>
</table>

Source: Bridging the Gap Program, Health Policy Center, University of Illinois at Chicago, 2010
State Sales Taxes on Regular and Diet Soda as of July 1, 2010

Note: Three states also impose a mandatory statewide local tax that is not reflected in the above data: CA (1%), UT (1.25%), VA (1%).

Source: Bridging the Gap Program, Health Policy Center, University of Illinois at Chicago, 2010
Map Legend

- States with excise taxes (N=3)*
- States with other license/privilege fees/Taxes (N=4)*
- States with current SSB legislative proposals (N=8; includes RI with an existing tax)
- States with SSB legislative proposal that died (N=1)

*Additional excise/ad valorem (non-sales) taxes may be applied at the manufacturer, distributor, wholesaler, and/or retailer levels and are applied to bottles, syrup, powders and/or mixes. Taxes apply to regular and diet soda, isotonics, and sweetened tea in AL, AR, RI, TN, and WV. Taxes only apply to regular and diet soda in VA and WA.

Source: Bridging the Gap Program, Health Policy Center, University of Illinois at Chicago, 2010
State SSB-related Legislative Activity,
2010 Legislative Session (includes carryover)—as of 8/27/10

8 states have introduced SSB-specific excise/ privilege tax bills during the current legislative session:

California and Kansas (tax upon sweetened beverage manufacturers at a rate of $0.01/teaspoon sugar in SSB/concentrate)

Hawaii (1% gross proceeds on sale of SSBs)

Mississippi ($0.02/ounce or $2.56/gallon produced from syrup)—Died in Committee

New Mexico ($0.005/ounce imposed on distributors)

New York ($1.28/gallon bottled soft drinks; $1.28/gallon soft drink produced from powder/mix; $7.68/gallon of syrup)

Rhode Island ($0.05/20 ounces or $0.10/>20 ounces) – in addition to existing non-sales taxes

South Carolina ($0.01/13.5 grams of concentrate of sugar placed into SSB concentrate imposed on manufacturers)

City-level tax proposals

Philadelphia - $0.02/ounce – Died in City Council

Washington DC - $0.01/ounce – Died in DC Council (but did extend sales tax base to include SSBs effective 10/1/10)

Source: Bridging the Gap Program, Health Policy Center, University of Illinois at Chicago, 2010

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Future Research and Tax Policy Design Implications

• Evidence as we go … jurisdictions that adopt higher taxes on sugar sweetened beverages will provide natural experiments for researchers to examine the effectiveness of these efforts in promoting healthier dietary intake and curbing the obesity epidemic.

• Tax Policy Design: Implications for Potential Impact on Health Outcomes
  ❖ Issues of applicability to SNAP purchases
  ❖ Excise tax rather than a sales tax
    ➢ Incorporated at shelf price
    ➢ Applicable regardless of where items are sold
    ➢ Applied on a per unit basis rather than a function of price so that quantity discounts are still taxed.
  ❖ Dedication of tax revenue to nutrition and physical activity programs
Policies to Encourage Healthy Eating

• Subsidies for fruits and vegetables
  ❖ Demand Side of the Market through SNAP (or other programs)
  ❖ Supply Side of the Market through subsidies to suppliers/vendors

• Greater subsidization of healthy school meals

• Other school policies related to standards for competitive foods

• Zoning policies and tax breaks for vendors (potentially targeted to underserved areas; school zones)

• Menu labeling

• Advertising restrictions; Public Service Announcements
Thank you to my UIC collaborators:

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- Tamkeen Khan
- Jamie Chriqui
- Lisa Nicholson
- Ramona Krauss
- Binh Nguyen

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Institute for Health Research and Policy, UIC
http://www.ihrp.uic.edu

ImpacTeen
http://www.impacteen.org

Bridging the Gap
http://www.bridgingthegapresearch.org

Contact: powelll@uic.edu