Sugar-sweetened Beverage Taxes, Consumption and Obesity

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Webinar
Healthy Food Retail Policy Work Group
RWJF Healthy Eating Research program &
CDC Nutrition and Obesity Policy Research and Evaluation Network

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Outline of Presentation

• Background
  ➢ Risky consumption patterns
  ➢ Trends in contextual factors

• Empirical Evidence
  ➢ Price Elasticities
  ➢ Consumption and Weight Outcomes
  ➢ Evidence from recent SSB taxes

• Challenges and Policy Implications
  ➢ What to tax
  ➢ Tax pass-through
  ➢ Regressivity
  ➢ Job losses
  ➢ Tax design
Consumption Patterns

Key areas of concern:

• Energy dense food and beverages
  ➢ Products high in sugar and/or saturated fat
• Products that are consumed frequently

Examples of highly consumed products on a given day by youth include:

➢ Sugar-sweetened beverages (73%)
➢ Fast food (41%)
➢ Pizza (23%)

SSB Consumption Concern: Sources of Added Sugar in the American Diet

Trends in Energy Intake from SSBs: Youth aged 2-19y

Trends in Energy Intake from SSBs: Adults aged ≥ 20y

U.S. SSB Consumption per day in Calories, by Age, 2009-2010

Source: National Health and Nutrition Examination Survey (NHANES) 2009-2010, author's own calculations
Despite downward trend in SSB consumption:

- From 1999-2000 to 2007-2008, the prevalence of sports/energy drink consumption increased:
  - 3 to 7% among children
  - 4 to 10% among adolescents
  - 3 to 8% among young adults
  - 1 to 4% among adults

- Prevalence of heavy (≥ 500 kcal/day) SSB consumption increased among children 2-11y and remained flat among adults
- Black versus white children and adolescents have higher odds of heavy fruit drink consumption
- Low-socioeconomic status children, adolescents, and adults have higher odds of heavy SSB consumption

Source: Han & Powell, Journal of the Academy of Nutrition and Dietetics, 2013
Selected Food Price Trends in the U.S., 1980-2014
Inflation Adjusted

# Mean Estimates of Price Elasticity of Demand for SSBs

U.S. Studies from 2007-2012

<table>
<thead>
<tr>
<th>Beverage Categories</th>
<th>Mean Price Elasticity Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSBs Overall(^a)</td>
<td>-1.21</td>
</tr>
<tr>
<td>SSBs</td>
<td>-1.08</td>
</tr>
<tr>
<td>Regular Carbonated Soft Drinks</td>
<td>-1.25</td>
</tr>
<tr>
<td>Sports Drinks</td>
<td>-2.44</td>
</tr>
<tr>
<td>Fruit Drinks</td>
<td>-1.41</td>
</tr>
<tr>
<td>Soft Drinks (reg+diet)</td>
<td>-0.86</td>
</tr>
</tbody>
</table>

Source: Powell et al., *Obesity Reviews*, 2013
Recent Evidence on SSB Tax Impacts on Demand from Mexico and Berkeley, CA

- **Mexico:** Federal excise tax of 1 peso/L on SSBs (approx 10% price increase based on 2013 prices); effective Jan 1, 2014
  - Average volume of taxed beverages purchased was 6% lower in first year post-tax and was 12% lower by December 2014
  - Reduction greatest among low-income households: averaging -9.1% and reaching -17.4% by December 2014

- **Berkeley, CA:** $0.01/oz SSB tax; effective March 2015
  - SSB consumption frequency among individuals living in low-income neighborhoods 4 m post-tax fell 21% compared to a 4% increase in comparison cities
  - Water consumption increased 63% compared to 19% in comparison cities

Source: Colchero et al., *BMJ*, 2016; Falbe et al., *AJPH*, 2016
# Evidence on SSB Price/Tax Effects on Body Weight Outcomes

Source: Powell et al. *Obesity Reviews*, 2013

<table>
<thead>
<tr>
<th>Author</th>
<th>Price / Tax Measure</th>
<th>Data Set</th>
<th>Population (Sample size)</th>
<th>Model</th>
<th>Outcome Measure</th>
<th>Evidence for Tax Effects - Fast Food Prices and Sugar Sweetened Beverage prices/taxes: Direction/Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: Evidence for Adults</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SDT: - (- in 9 subpopulations)  
SDT: + (- in 15 subpopulations) |
RCSDP: - women RE; + women FE |
| **Panel B: Evidence for Children and Adolescents**|                     |                         |                               |       |                 |                                                                                                     |
VM CST: + |
SDT: +  
SDT: - |
SDT: + |
| Sturm, Powell, Chiriqui, and Chaloupka (2010) | State-level tax     | ECLS-K, 2004            | 5th graders (n=7300)         | CS    | BMI             | CST: -  
CST: - at risk of overweight |
| Wendt and Todd (2011)           | Prices ($)          | ECLS-K, 1998-2007       | K through 8th graders (n=51,160) | CS and Long. | BMI             | CBP: +0.03 CS; +0.04 FE  
CBP: -0.06 male FE; -0.09 near-poor FE; -0.03 white FE; -0.07 Hispanic FE; -0.03 children metro areas FE  
CBP: +0.03 at 25th quantile FE; -0.03 at 50th quantile FE  
FDP: +0.00 CS; -0.01 FE  
FDP: +0.02 at 25th quantile FE; -0.01 at 50th quantile FE |

Source: Powell et al. *Obesity Reviews*, 2013
Impact of Fast Food Consumption on Caloric and Dietary Intake: Example for Youth 12-19

• Based on analyses of 24 hr diet recalls, 41% of U.S. youth aged 12-19 consume fast food on a given day
  ➢ 40% for white, 46% for black, and 41% for Hispanic youths

• Among those who consume, 988 kcal daily intake from fast food

• First difference estimation based on two 24-hr diet recalls reveals that fast food consumption is associated with additional intake of 309 kcal/day and additional saturated fat, sugar and sodium
  ➢ When consumed “in” restaurant – substantially larger impact on added intake of SSBs

• Tax fast food? Elasticity: -0.5

Sources: Powell and Nguyen, AJPM, 2012; Powell and Nguyen, JAMA Pediatrics, 2013; Powell et al., Obesity Reviews, 2013
Challenge: What to Tax?

• Food categories or nutritional content?
• Challenges in defining food categories:
   SSBs and dairy exemptions
   Food versus candy: “flour as an ingredient”
• Prepared foods
• Fast food
Evidence on tax impacts on SSB prices: i.e., what is the pass-through rate?

Mexico: Excise tax of 1 peso/L on SSBs; Jan 1, 2014
- Full pass through

Berkeley: 1 cent/ounce on SSBs; March 1, 2015
- 3-months post tax implementation: soda (69%), fruit-flavored beverages (47%) and SSBs overall (47%)
- 5-months post tax implementation: 21.7% pass through (Coke and Pepsi)

Sources: Colchero, Plos One, 2015; Falbe et al. AJPH, 2015; Cawley and Frisvold, NBER 2015
Industry argues that SSB taxes will lead to job losses

In addition to own price effects, models need to account for income and substitution effects and effects from government revenue

Evidence for two U.S. states reveals no net decline in jobs: IL (0.06%) and CA (0.03%)

### Impact of Sugar Sweetened Beverage Tax on Total Jobs and Jobs in Selected Industries, Simulated Effects with no Explicit Beverage Substitution Effects

<table>
<thead>
<tr>
<th></th>
<th>Industry Effect Only</th>
<th>Industry + Inc/Sub Effects</th>
<th>Industry + Inc/Sub + Gov Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><em><strong>Illinois</strong></em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Jobs</td>
<td>-7,002</td>
<td>-5,979</td>
<td>4,406</td>
</tr>
<tr>
<td>Beverage Mfg</td>
<td>-1,359</td>
<td>-1,359</td>
<td>-1,357</td>
</tr>
<tr>
<td><em><strong>California</strong></em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Jobs</td>
<td>-14,992</td>
<td>-12,137</td>
<td>6,654</td>
</tr>
<tr>
<td>Beverage Mfg</td>
<td>-2,306</td>
<td>-2,303</td>
<td>-2,294</td>
</tr>
</tbody>
</table>

Source: Powell, Wada, Persky and Chaloupka, *AJPH*, 2014
Challenge: Regressivity

Price Elasticity of Caloric Intake of Regular Soda, by Age and Socioeconomic Status
NHANES, 1999-2008

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Poor</th>
<th>Non-poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>-0.81***</td>
<td>-1.07**</td>
<td>-0.53</td>
</tr>
<tr>
<td>Adolescents</td>
<td>-0.52***</td>
<td>-0.50</td>
<td>-0.53*</td>
</tr>
<tr>
<td>Adults</td>
<td>-0.66***</td>
<td>-1.03***</td>
<td>-0.51***</td>
</tr>
</tbody>
</table>

Source: Wada, Han and Powell, *Food Policy*, 2015

- Progressive behavior change and health benefit
- Reframing the regressivity argument
### Tax Types and Application

<table>
<thead>
<tr>
<th>Type of Tax</th>
<th>How Tax Applied</th>
<th>Where Tax is “Presented” to Consumers</th>
<th>Where in Distribution Chain Tax is Collected</th>
<th>Impact on Consumption</th>
<th>Generate $$$ to Dedicate for Public Health</th>
</tr>
</thead>
</table>
| Excise      | Specific (based on volume/size/quantity) or Ad Valorem (% price) | Shelf-Price | ➢ Manufacturer  
➢ Wholesaler  
➢ Distributor  
➢ Retailer | Depends on:  
➢ what food item(s) is taxed,  
➢ amount of tax, **and**  
➢ pass-through rate | Yes, if sizeable; need to adjust tax amount for inflation |

Sales  
Ad Valorem (% price)  
Point-of-sale (Cash Register)  
➢ Consumer  

Source: Chriqui et al., *Journal of Public Health Policy*, 2013
Thank you!

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