Cost-Effective Strategies to Limit Sugar Sweetened Beverages in Children – What Can We Expect?

Steven Gortmaker  PhD
Harvard TH Chan School of Public Health

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To reduce population obesity levels:

- We need to move beyond simply asking “what is effective?” and also consider costs of interventions and their likely impact on population health.
- CHOICES\(^1\) has examined over 40 obesity programs and policies high on the national agenda.
- Conducted systematic reviews of 130,000 peer-reviewed publications for evidence of effect.

\(^1\)http://choicesproject.org/
CHOICES cost-effectiveness studies

- Estimated costs of interventions following standard guidelines
- Projected the population impact of interventions and their cost-effectiveness over 10 years in the United States with a microsimulation model using “big data”


Virtual population = 1 million people

- Based on massive amounts of national, state and local data
- Accounts for personal characteristics like dietary intake, body growth, and behaviors like smoking
CHOICES microsimulation model

INTERVENTION SCENARIO

VIRTUAL POPULATION
Start: 2015

From 2010 U.S. Census Data

POPULATION FACTORS
Population Growth
BMI Trends
BRFSS
NHANES

INDIVIDUAL FACTORS
Body Growth
Personal Characteristics (e.g. dietary intake)
Smoking

HEALTH STATUS
Obesity

INTERVENTION
Dietary Intake/Physical Activity

OUTCOMES
Obesity
Healthcare Costs
Mortality

Simulate to: 2025
Focus on implementation of interventions to improve nutrition & physical activity environments

Sugar sweetened beverages

- We define sugar sweetened beverages: soda, sport drinks, fruit drinks and punches, sweetened tea, and other sweetened beverages (see Wang et al 2008)

- This does not include 100% juice or flavored milk.
Interventions to reduce SSB intake in children

- A sugar sweetened beverage excise tax (e.g. 1 cent per oz. as in Berkeley, San Francisco, Oakland, Albany CA)
- Interventions that limit SSB intake in early care and education settings (e.g. NAP SAAC)
- School-based interventions (e.g. Smart Snacks regulations implemented under the Healthy, Hunger-Free Kids Act to eliminate junk food and beverages outside of school meals)
Reach: Where do children drink SSBs?

FIGURE 1
Per-capita kilocalories from SSBs and FJs combined according to location of consumption: 1999–2004. “Restaurants” includes self-serve buffets, cafeterias, delicatessens, restaurants, stores, and take-out restaurants; “other” includes in transit (boats, cars, planes), community-feeding programs, work, day camp, day care, and other.

A double blind randomized trial in children (ages 4-11) shows clear evidence of effect (de Ruyter, 2012)

Multiple other randomized trials and change and change studies also show similar effects (e.g. Malik et al 2013)

The evidence among children 0-5 years of age is less robust – problems of measurement, fewer studies (and mixing change and change and baseline predicting change studies) – but little reason to doubt effect
Evidence of larger effects, if higher BMI

- In the double blind randomized trial in children (ages 4-11) with effects on BMI over an 18 month study – there is clear evidence for larger effects for children with higher BMI at baseline (Katan M et al 2017).

- This higher BMI group in the Dutch study (18.4) was the average BMI in US ages 6-11 in 2009-10 (Ogden et al 2012).

- So, the estimates of effect we assume for changes in SSB intake on changes in BMI in our CHOICES models are likely underestimates.
Example interventions to reduce childhood obesity

### NET COST SAVINGS AFTER 10 YEARS

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Estimated Cost Savings</th>
<th>Cases of Childhood Obesity Prevented in 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSB Tax</td>
<td>$14.2 billion</td>
<td>576,000 cases</td>
</tr>
<tr>
<td>Smart Snacks</td>
<td>$792 million</td>
<td>344,649 cases</td>
</tr>
<tr>
<td>NAP SAAC</td>
<td>$731 million</td>
<td>38,400 cases</td>
</tr>
</tbody>
</table>

1. The SSB Tax intervention would also produce an estimated $12.5 (2015) billion/year in tax revenue. This is not included in the cost-effectiveness analysis.
2. 95% uncertainty interval

www.choicesproject.org
Example interventions to reduce childhood obesity

**HEALTH CARE COST SAVINGS Per $1 INVESTED**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Cost Savings Per $1 Invested</th>
<th>95% Uncertainty Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSB Tax</td>
<td>$32.53</td>
<td>($6.07, $113.94)</td>
</tr>
<tr>
<td>Smart Snacks</td>
<td>$4.56</td>
<td>($2.13, $7.01)</td>
</tr>
<tr>
<td>NAP SAAC</td>
<td>0.04</td>
<td>($0.01, $0.07)</td>
</tr>
</tbody>
</table>


2 95 percent uncertainty intervals
Impact of SSB Excise Tax on Percentage Reduction (95% UI) in Childhood Obesity Prevalence, by Race/Ethnicity

Impact of SSB Excise Tax on Percentage Reduction (95% UI) in Childhood Obesity Prevalence, by household income

- >350% poverty level: 0.80%
- 186-350% poverty level: 0.86%
- 131-185% poverty level: 0.87%
- ≤130% poverty level: 0.91%

1.14 times greater, compared to highest income
1.09 times greater, compared to highest income
1.07 times greater, compared to highest income

Summary: cost-effective interventions

- Some interventions are projected to prevent future obesity and save more in health care costs than they cost to implement.
- A Sugar Sweetened Beverage excise tax and Smart Snacks are two examples.
- These two interventions are also examples of strategies that work to improve population health equity while they improve population health overall.
Summary: cost-effective interventions

• One policy implication of these findings: we should make sure that Smart Snacks is continued

• Another policy implication is that states and cities should look carefully at the potential for an SSB excise tax to cost-effectively improve population health, improve health equity – and raise funds for other preventive activities

• Berkeley, San Francisco, Oakland, Albany, Boulder, Cook County (Chicago), Philadelphia, Seattle have already passed excise taxes on SSBs
Summary: cost-effective interventions

• Only some interventions will be cost-saving over this 10 year period.
  – We need to invest in children’s early education – and can always identify best value for money strategies
  – Studies indicate that replacing SSBs and juice with water saves $ (Wright et al 2015)

• Our studies have identified many interventions that can effectively prevent cases of childhood and adult obesity and do so at reasonable cost

• One single preventive strategy will not solve the obesity epidemic: multiple strategies are needed
Summary: cost-effective interventions

• We cannot expect to treat our way out of the obesity epidemic: treatment makes a relatively small impact on obesity prevalence – too little, too late and generally expensive.

• Preventive strategies – to slow the rise in excess weight gain over the life-course – are key

• In working with many states (WA, OK, AK, MS, WV, NH) we have found widespread bipartisan support for the search for best value for money strategies
What about 100% juice?

- Much more 100% fruit juice is served in ECE center-based settings than SSBs
- Limits on portions of 100% juice have limited intake
- Limited evidence linking change in 100% juice to change in BMI and obesity in 2-5 year olds
- Major measurement limitations in young children! Unreliable measurement will attenuate relationship.
- No RCTs that examine change in 100% juice on change in BMI in young children.
  - Most studies are baseline predicting change
  - In adolescents and adults this type of flawed analysis indicates little relation of SSB intake to BMI – whereas change and change studies mirror RCT results showing direct effect of SSB on BMI
Why we need change and change analyses

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Coefficient Estimate (P-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in BMI</td>
<td>0.01 (P=0.85)</td>
</tr>
<tr>
<td>BMI controlling for baseline BMI*</td>
<td>0.20 (P=0.01)</td>
</tr>
<tr>
<td>Change in BMI**</td>
<td>0.16 (P=0.03)</td>
</tr>
</tbody>
</table>


**Uses same data and variables as in Ludwig et al 2001, but fixed effects regression (change predicting change)

Similar results are seen in Mozaffarian et al 2011 analyses of change in SSBs and change in weight in adults