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Research Informing Policies & Practices
for Healthy Youth

Economics of Sugar-Sweetened Beverage Taxation

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Supported by grants from RWJF and NHLBI

American Public Health Association
Denver, CO, November 8, 2010

Presenter Disclosure

Frank J. Chaloupka

The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose

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Overview

- Economic rationale for sugar sweetened beverage taxation

- Overview of current SSB taxes

- Recent/ongoing BTG research on impact of SSB prices on consumption and weight outcomes

- Alternative SSB tax structures

- Revenue generating potential of SSB taxes

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Economic Rationale for SSB Taxation

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Economic Rationale for SSB Taxes

- In addition to public health rationale, government intervention warranted when 'market failures' exist

- 'Negative Externalities'
    - *Situation where consumer or producer does not bear the full cost of their consumption or production*
    - With SSBs, clearest negative externality is the significant health care costs paid for by public health insurance programs
        - Estimated at $147 billion in 2006 (Finkelstein, et al., 2009)
        - 9.1% of overall health care spending in US
        - About half paid for through Medicaid and Medicare
        - Rising rapidly
    - Additional costs borne by employers

Economic Rationale for SSB Taxes

- 'Imperfect Information'
  - *Consumers do not fully understand the costs and benefits of their consumption decisions*
    - Less than complete information about the caloric content of beverages consumed
    - Imperfect understanding about impact of consumption on weight, health
    - Distorted by pervasive marketing
    - Compounded by early age at which consumption begins and habit formation

- 'Time Inconsistent Preferences'
  - *Tradeoffs between immediate gratification and long-term impact*
    - Leads many to later regret consumption choices
    - Particularly true for younger, less educated populations who tend to have greater preference for the present

Economic Rationale for SSB Taxes

- 'First-Best' Interventions
  - *Those that deal directly with the market failure at issue*
    - Menu-labeling to provide information on caloric content
    - School-based and mass-media education efforts to inform about the role of SSB consumption in weight outcomes, health consequences

    - Often costly and at times ineffective in reaching most at-risk populations

- 'Second-Best' Interventions
  - *Blunter instruments that address market failure but have broader impact*
    - Taxes/subsidies that alter the relative prices of healthier, less healthy options can target financial externalities
    - Influence prices for all consumers, not just those who generate the external costs

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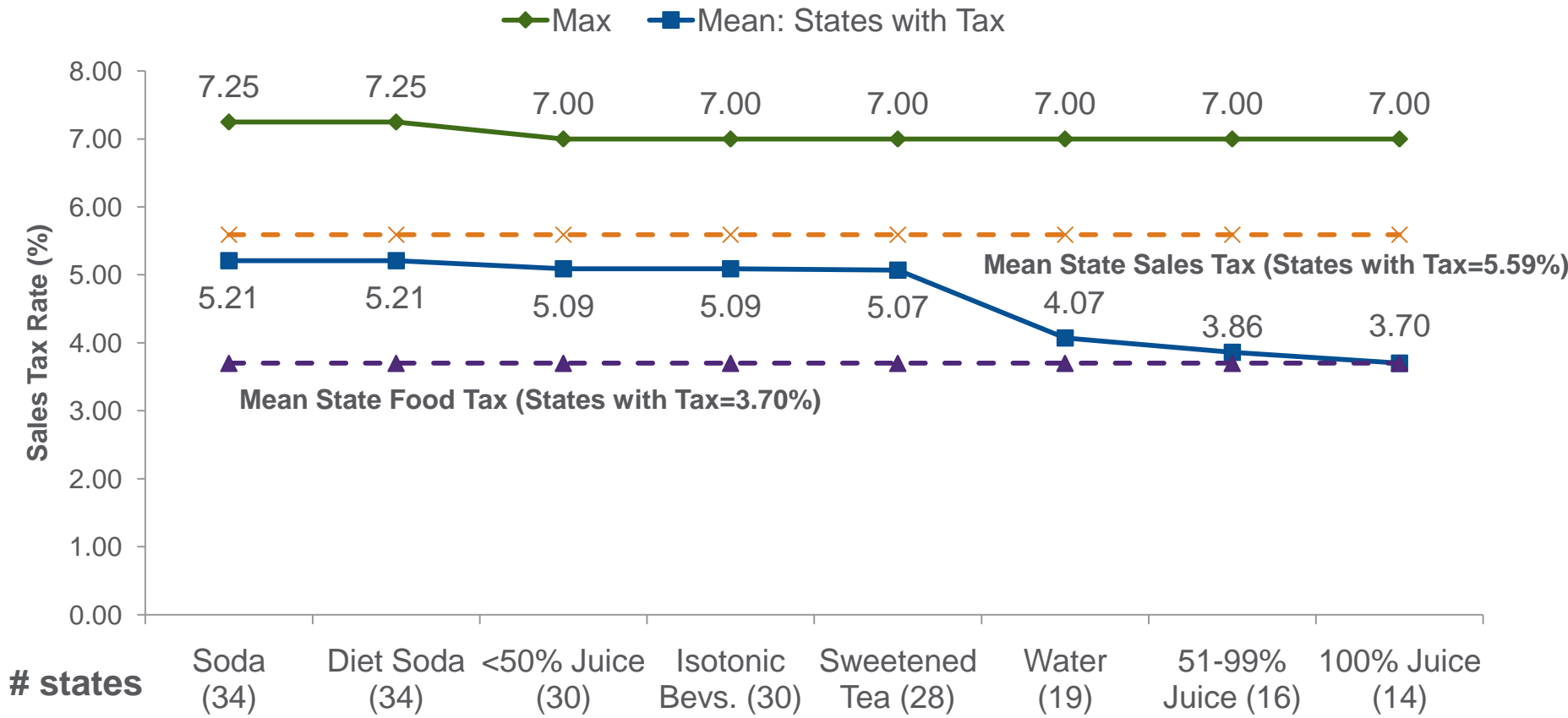# Current SSB Taxation

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Sales Taxes on Selected Beverages, **All States**
(as of July 1, 2010)
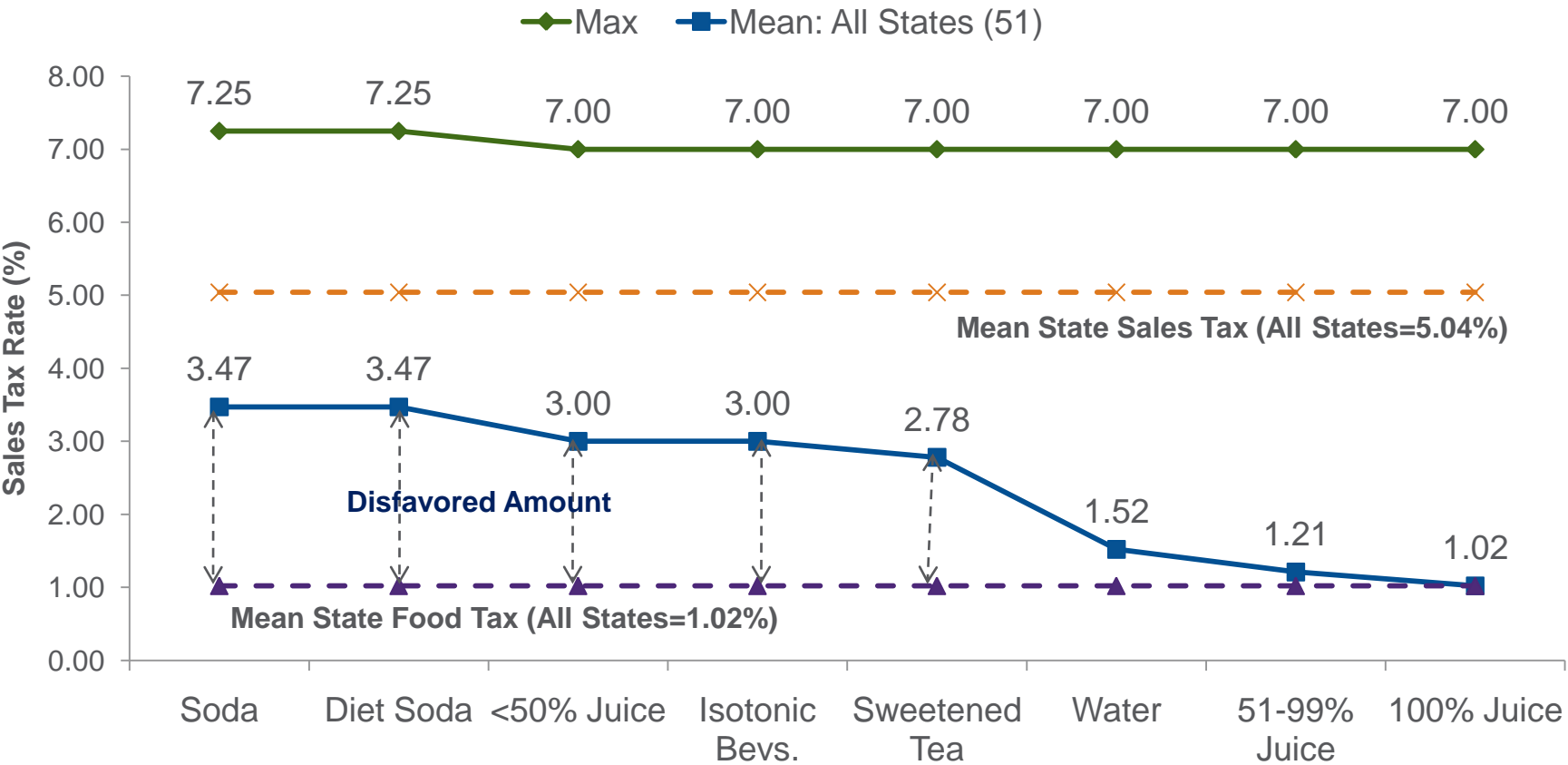
Note: Three states also impose a mandatory statewide local tax that is not reflected in the above data: CA (1%), UT (1.25%), VA (1%).

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

Legend: Max | Mean: States with Tax

	Soda (34)	Diet Soda (34)	<50% Juice (30)	Isotonic Bevs. (30)	Sweetened Tea (28)	Water (19)	51-99% Juice (16)	100% Juice (14)
Max	7.25	7.25	7.00	7.00	7.00	7.00	7.00	7.00
Mean: States with Tax	5.21	5.21	5.09	5.09	5.07	4.07	3.86	3.70

Mean State Sales Tax (States with Tax=5.59%)

Mean State Food Tax (States with Tax=3.70%)

Y-axis: Sales Tax Rate (%) — 0.00 to 8.00
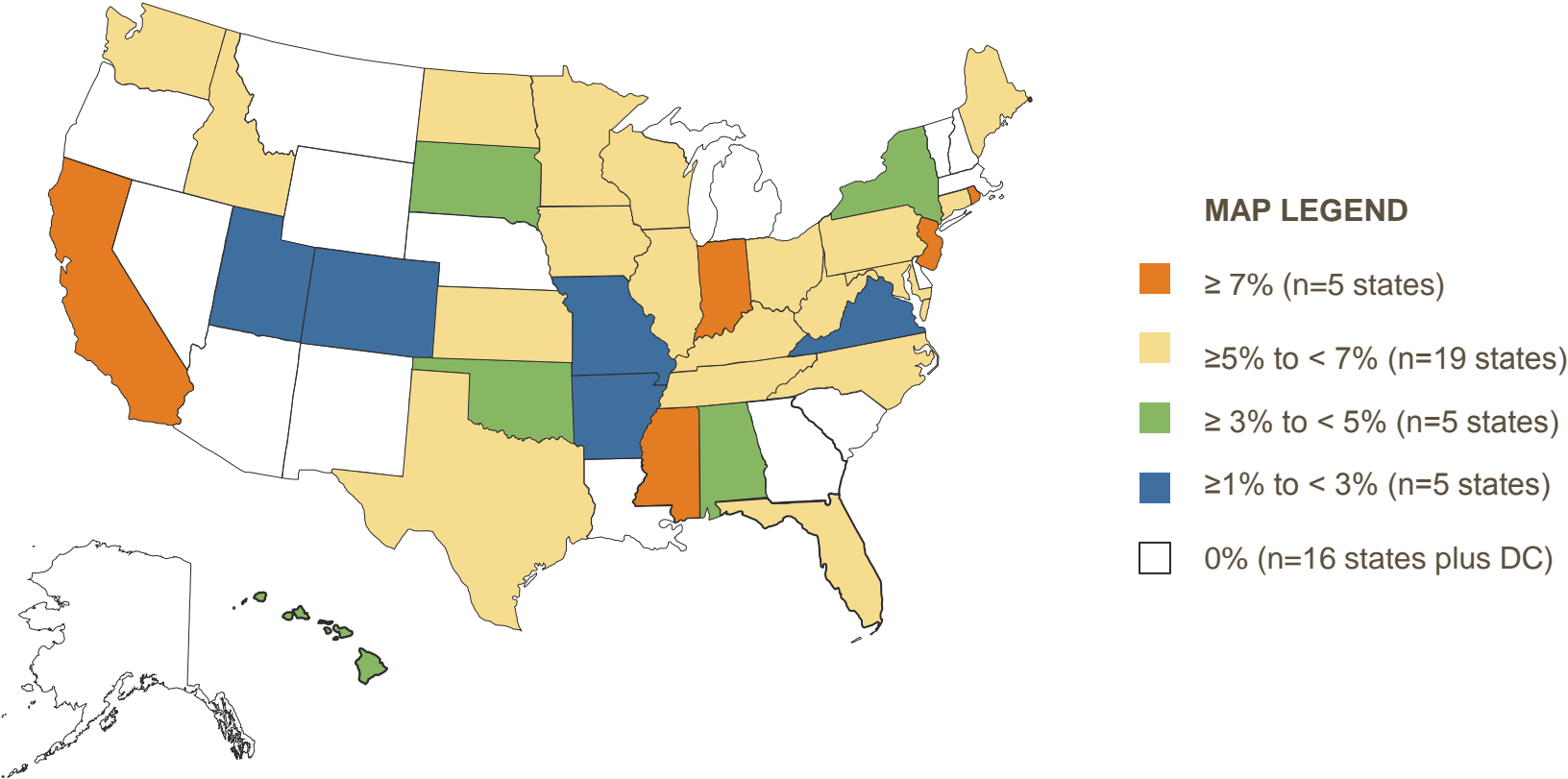
X-axis label: # states

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%).

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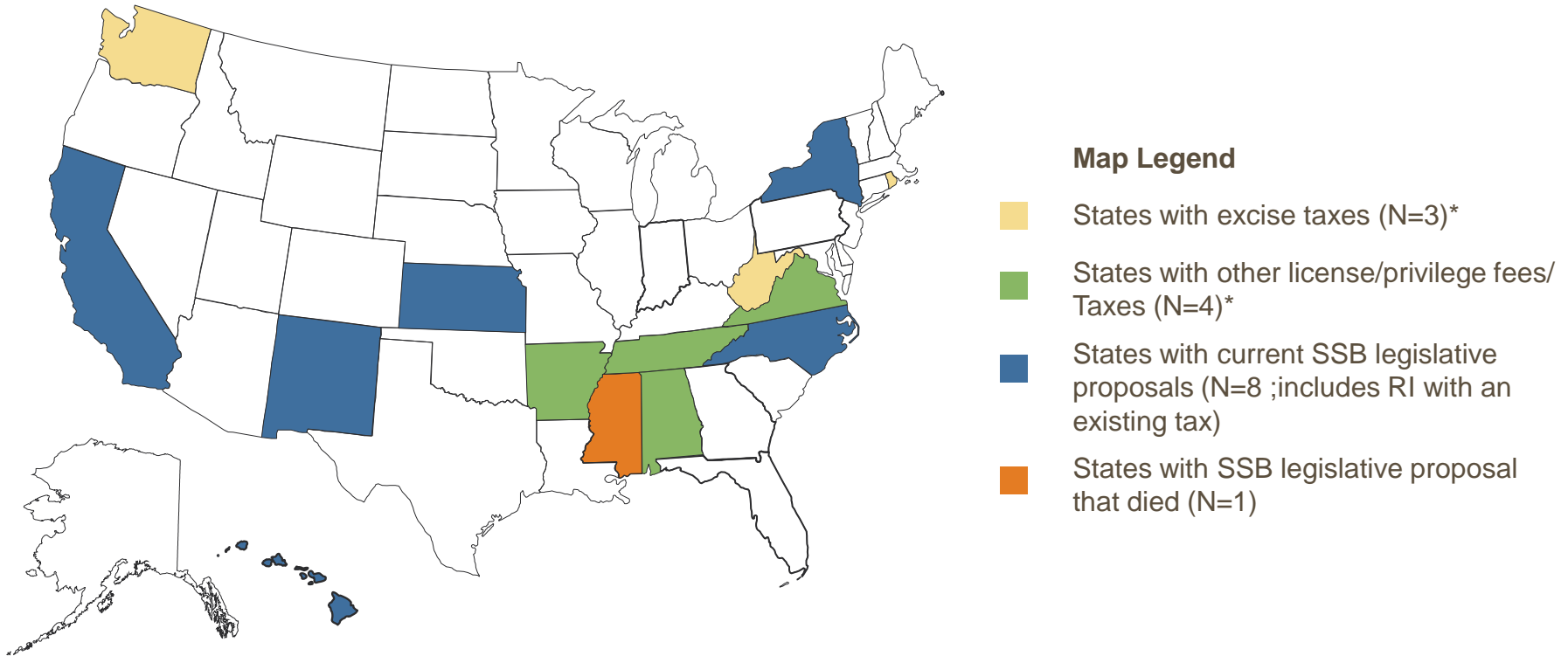# Sales taxes applied to vending machines sales, selected beverages (as of July 1, 2010)

	Mean all states (%)	Max (%)	N	Mean taxing states (%)
Soda	4.14	8.00	40	5.28
Diet Soda	4.14	8.00	40	5.28
≤ 50% fruit juice	4.02	8.00	39	5.26
Isotonic beverages	4.02	8.00	39	5.26
Sweetened teas (bottle/can)	3.90	8.00	38	5.24
Bottled water	3.38	8.00	34	5.07
>51% fruit juice, but < 100% fruit juice	3.30	8.00	33	5.10
100% fruit juice	3.30	8.00	33	5.10

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State Sales Taxes on Regular and Diet Soda as of July 1, 2010

MAP LEGEND

- ≥ 7% (n=5 states)
- ≥5% to < 7% (n=19 states)
- ≥ 3% to < 5% (n=5 states)
- ≥1% to < 3% (n=5 states)
- 0% (n=16 states plus DC)

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%).

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States with Non-Sales* Taxes on Selected Beverages (as of 7/1/10) or SSB-related Legislative Proposals in 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.

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SSB Taxes/Prices and Consumption & Weight Outcomes

Recent Evidence from Bridging the Gap

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Soda Prices & Obesity
Inflation Adjusted, 1978-2009
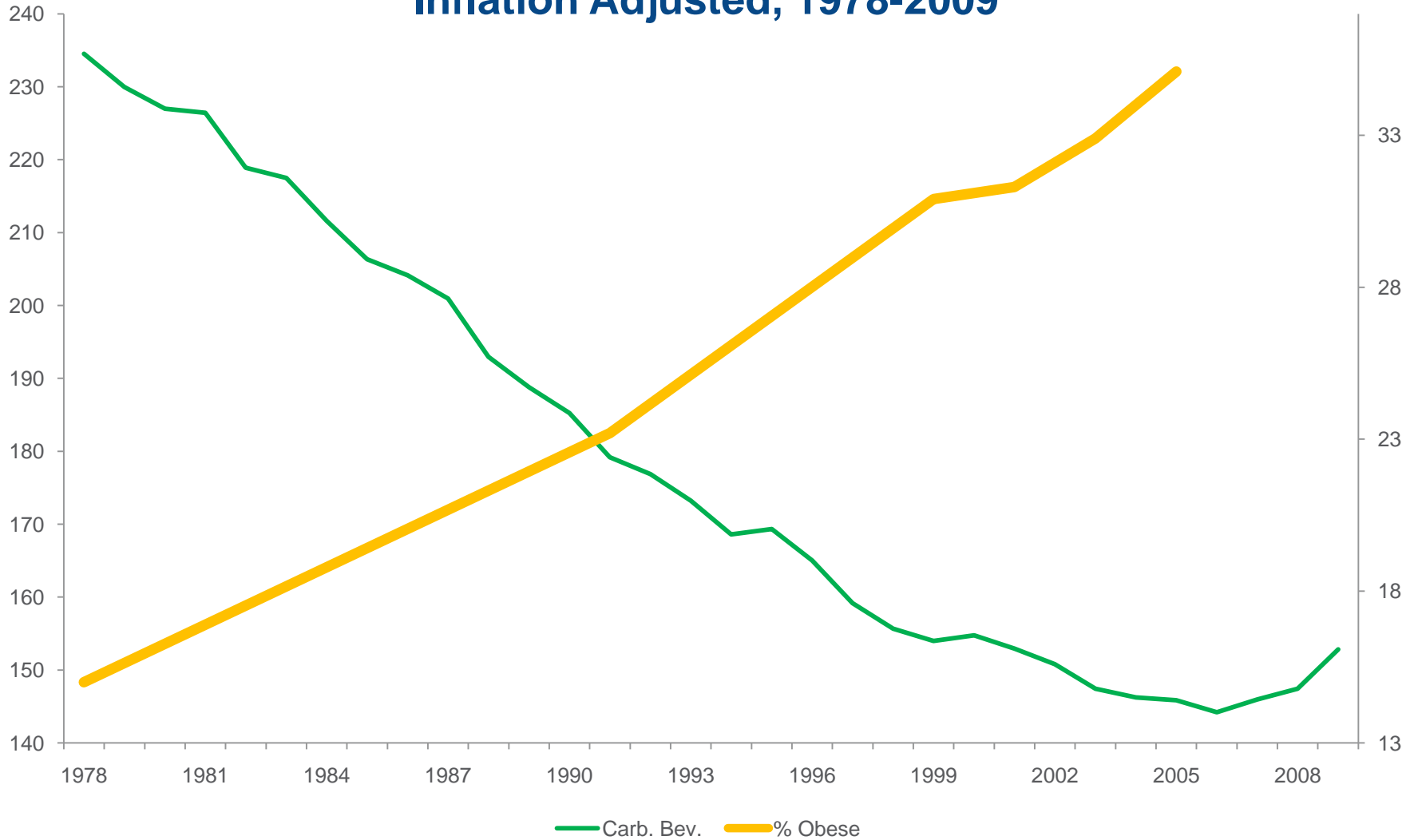
Carb. Bev. ——— % Obese

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Existing evidence

- Growing literature demonstrating the higher prices for SSBs lead to reductions in SSB consumption

- Andreyeva, et al.'s (2010) comprehensive review concluded that price elasticity of soft drink consumption was -0.78

  - Price elasticity: % change in consumption resulting from 1% price change

  - 10% increase in soft drink prices would reduce consumption by nearly 8%

- Limited, mixed evidence on impact of taxes/prices on weight outcomes

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Overview

- Empirically examine associations between state-level soda taxes and consumption and weight outcomes, using nationally representative data sets including:

  - A.C. Nielsen Homescan Data

  - Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K)

  - Monitoring the Future (MTF)

  - National Longitudinal Survey of Youth 1997 (NLSY97)

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Soda Taxes and Consumption

A.C. Nielsen Homescan Data

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Objective

- To examine the association of soda taxes with household soda purchases

Data Description

- Cross-section of household purchase information based on scanner data from a variety of stores, 2nd Q 2007

- Household demographic data

- Final sample includes 66,211 non-military households

- Outcome variable: soda volume in ounces of carbonated beverages purchased per household over the sample period (m=566 ounces ~ 2 cases of 12 oz cans)

- Control variables: household income, size, race, educational attainment, presence of children/age, female head of household employment status, and census regions

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Preliminary Results

OLS Regression Results: Soda Volume

	All Households	**Households with Children**	**Households without Children**
Disfavored Soda Tax Amount	-9.352**	-10.983**	-8.417**

Source: Loudermilk, Powell, Chriqui, and Chaloupka, *in progress*, 2010

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Policy Simulation Example: Household Regular Soda Purchases

- Study results imply very small tax elasticities for purchases of -0.06.

- If all states increased sales taxes to the maximum tax rate of 7% (an increase of 60.6% from the current sample mean of 4.36%), household purchases of regular soda are estimated to be 3.6% lower.

- Consider the imposition of a **new 20% tax** → assuming constant elasticity, household regular soda purchases are estimated to be **33% lower**.

  - ❖ The extent to which this applies to all regular soda consumption depends on constant elasticity noted above, and whether regular soda consumed away-from-home is similarly price/tax responsive.

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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

Outcome Variable	Total Consumption		School Consumption		BMI Change	
	Higher Soda Tax Amount	Higher Soda Tax Indicator	Higher Soda Tax Amount	Higher Soda Tax Indicator	Higher Soda Tax Amount	Higher Soda Tax Indicator
Full Sample	-0.004	-0.006	-0.010	-0.064*	-0.013*	-0.085**
At Risk of Overweight	-0.026	-0.078	-0.011	-0.067	-0.033**	-0.222**
Low-Income	-0.142*	-0.811	-0.039**	-0.239**	-0.000	-0.005
African American	-0.125	-0.767	-0.103**	-0.585**	0.029	0.086
9+ Hrs TV	-0.073	-0.376	-0.029**	-0.178**	-0.014	-0.091

Source: Sturm, Powell, Chriqui, and Chaloupka, *Health Affairs*, 2010

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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.

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Soda Taxes and Adolescents' Weight

National Longitudinal Survey of Youth 97

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Objective

- To examine association of soda taxes with youths' BMI using cross-sectional *and* longitudinal models

Data Description

- Nationally representative longitudinal data on youth aged 12 to 17 in 1997; 4 waves of including 1997, 1998, 1999 and 2000
- Estimation sample includes 11,900 person-year observations living at home
- Information on parental characteristics available from parental questionnaire and annual household roster data
- <u>Outcome variable</u>: weight status: BMI and overweight prevalence
- <u>Control variables</u>: age, gender, race, ethnicity, income, mother's education, mother's employment status
- <u>Neighborhood controls</u>: median household income

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Preliminary Regressions Results-Cross Sectional Analysis

	Female		Male	
	BMI	Overweight	BMI	Overweight
Full Sample				
0<tax≤4%	0.0552	0.0019	-0.0337	-0.0055
4%<tax≤5%	0.1339	0.0017	-0.1457	-0.0160
5%<tax≤6%	-0.0797	-0.0105	0.2203	0.1010
tax>6%	-0.0548	-0.0053	0.5410*	0.0257
Low Income				
0<tax≤4%	-0.5963	-0.0371*	-0.5030	-0.0556**
4%<tax≤5%	0.2401	-0.0094	-0.2245	-0.0073
5%<tax≤6%	-0.3359	-0.0436**	-0.1683	-0.0470**
tax>6%	-0.4483	-0.0369*	-0.4099	-0.0435**

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Preliminary Regressions Results-Longitudinal Analysis (FE)

	Female		Male	
	BMI	Overweight	BMI	Overweight
Full Sample				
0<tax≤4%	-0.7805**	-0.0078	-0.4054***	-0.0503
4%<tax≤5%	-0.7938**	-0.0153	-0.0942	-0.0369
5%<tax≤6%	-0.2033	0.0308*	-0.2297	-0.0591
tax>6%	-0.5647	0.0667*	0.4693	-0.0212
Low Income				
0<tax≤4%	-2.1950***	-0.0628***	-1.0196***	-0.0922***
4%<tax≤5%	-2.3600***	-0.0737**	-0.5907*	-0.0732***
5%<tax≤6%	-1.1818	-0.0162	-1.5229***	-0.0879***
tax>6%	-0.2139	0.0847	0.5069	-0.0969**

Source: Powell et al., *in progress*, 2010

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Summary: Policy Implications of Empirical Results

- Generally very small associations between soda taxes and consumption or weight outcomes based on the existing low tax rates which range up to just 7% in the study samples.

- Larger associations for populations at greater risk for obesity.

- *Substantial* increases in soda tax rates may have some measureable effects on outcomes and even greater effects at the population level.

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SSB Taxes – Structure and Revenue Generating Potential

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Alternative Approaches to SSB Taxation

Approach	Specific Tax/ Fee on Quantity of Sugar or Bev. Volume	Ad Valorem (% of price)	Upon Whom Tax Imposed	Where Tax Presented to Consumer
Non-Sales Taxes				
Tax all SSBs	X	X	Manufacturer Distributor Wholesaler Retailer	Shelf-price
Tax all Beverages (or selected including non-SSBs)	X	X	Manufacturer Distributor Wholesaler Retailer	Shelf-price
Sales Taxes				
Tax all SSBs		X	Consumer	Point of purchase
Tax all/selected Beverages		X	Consumer	Point of purchase

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Alternative Approaches to SSB Taxation—
Examples Assuming 20 oz. bottle of soda at $1/bottle

Type of Tax	Taxable Beverage(s)	Tax Approach	Where Tax Presented to Consumer	Tax Amount	Total Price
Non-sales	**All SSB** bottles/ syrups/powders	Excise tax -- $0.01 per gram* sugar	Shelf price	$0.55	$1.55
Non-sales	**All SSB and ASB** bottles/ syrups/ powders	Ad valorem – 50% of Retail price	Shelf price	$0.50	$1.50
Sales	All **SSBs and ASBs**	Ad valorem – 6% of price	Check out	$0.06	$1.06

*According to the USDA National Nutrient database, there are 55.08 grams of sugar per 20 oz. bottle of sugar-sweetened soda

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Alternative Approaches to SSB Taxation

- From a public health perspective, specific excise tax preferable to sales tax or ad valorem excise tax for several reasons:

  - More apparent to consumer

  - Easier administratively

  - Reduces incentives for switching to cheaper brands, larger quantities

  - Revenues more stable, not subject to industry price manipulation

  - Greater impact on consumption; more likely impact on weight outcomes

  - Disadvantage: need to be adjusted for inflation

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SSB Taxation & Revenues

- Revenue generating potential of tax is considerable

    - SSB Tax calculator at:
    http://www.yaleruddcenter.org/sodatax.aspx

    - Tax of one cent per ounce could generate:
        - $14.9 billion nationally if on SSBs only
        - $24.0 billion if diet included

    - Tax of two cents per ounce:
        - $21.0 billion nationally, SSBs only
        - $39.0 billion if diet included

    - Earmarking tax revenues for obesity prevention efforts would add to impact of tax

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For more information:
http://www.bridgingthegapresearch.org/research/sodasnack_taxes/