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Research Informing Policies & Practices
for Healthy Youth

Food and Beverage Pricing: Implications for Public Policy

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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

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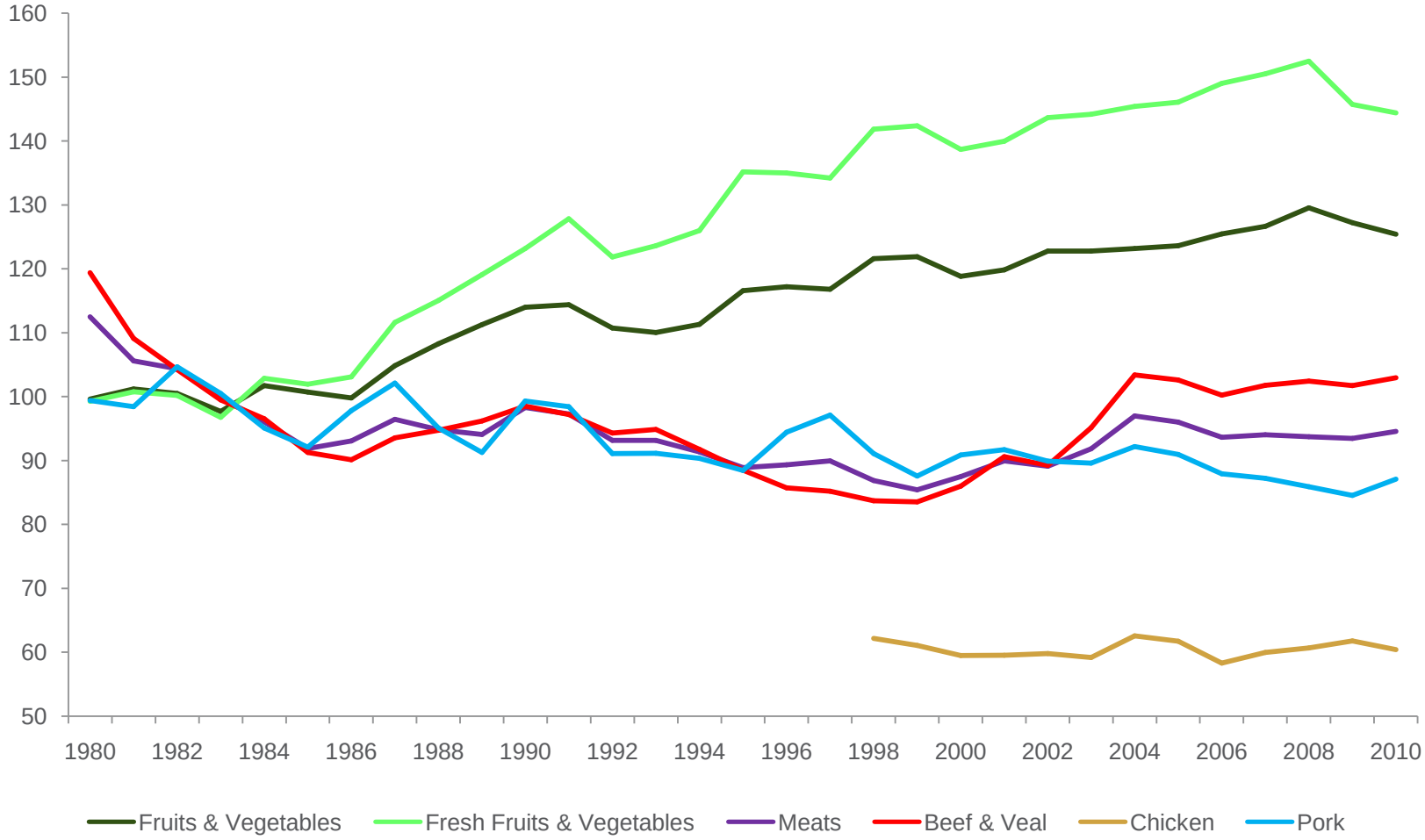
Selected Food Price Trends, 1980-2010
Inflation Adjusted



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Source: Bureau of Labor Statistics, 2011

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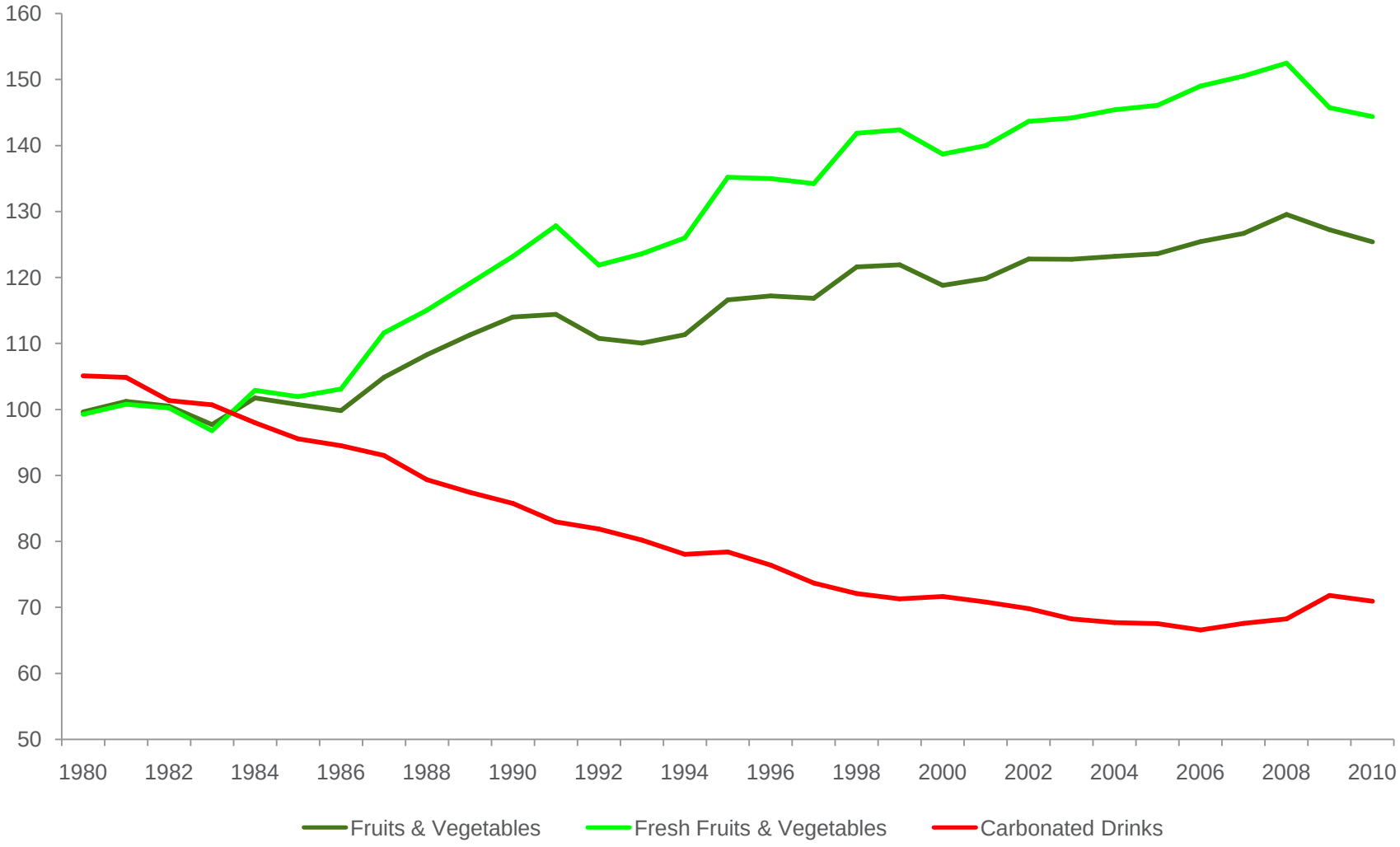

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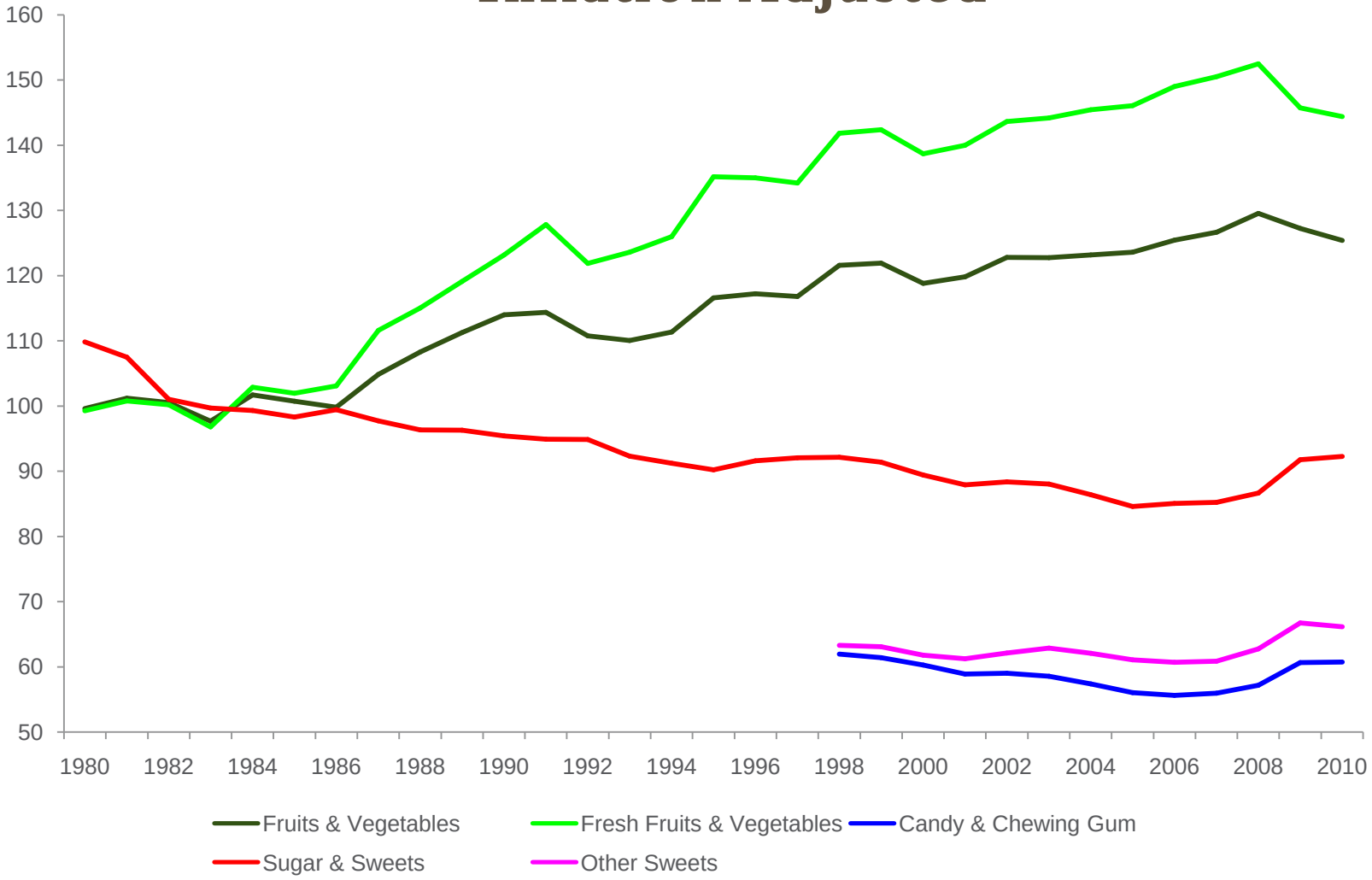

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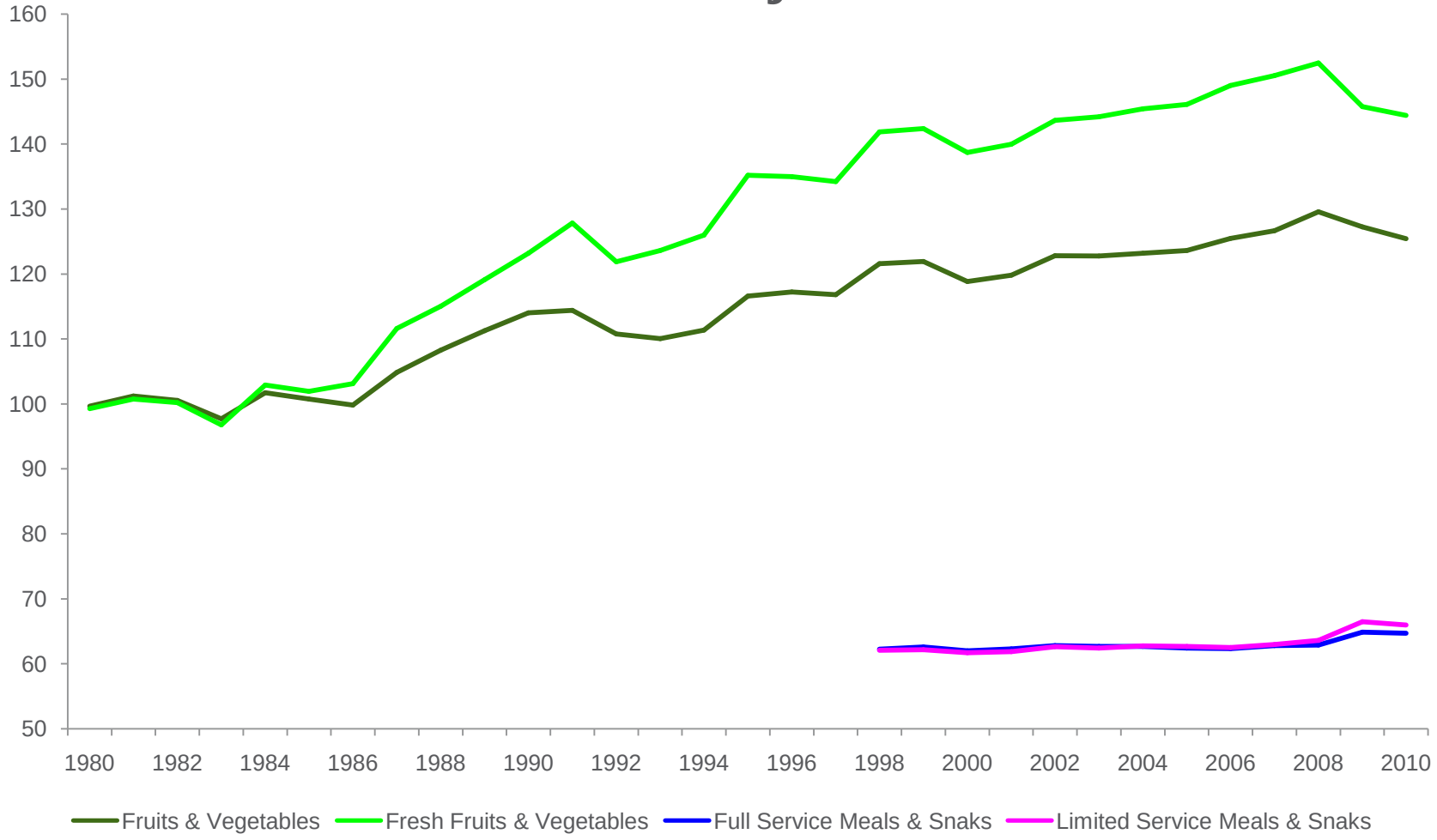

Source: Bureau of Labor Statistics, 2011

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%

Source: Andreyeva, T, M Long, and K. D. Brownell, "The impact of food prices on consumption: a systematic review of research on price elasticity of demand for food." *American Journal of Public Health.* 100 (2010): 216-222.

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%

Source: Smith, T. A., B.-H. Lin, and J-Y Lee. Taxing caloric sweetened beverages: Potential effects on beverage consumption, calorie intake, and obesity. Economic Research Report Number 100. 2010. United States Department of Agriculture, Economic Research Service.

Food Prices: Consumption & Weight Outcomes

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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

Dependent Variable: BMI Percentile Among Children	Cross-sectional Estimates			Longitudinal Fixed Effects Estimates		
	All	Low Income	Low Education	All	Low Income	Low Education
Price of Fruits & Vegetables	0.24***	0.27*	0.36***	0.25*	0.58**	0.47**
Price of Fast Food	-0.16	-0.77***	-0.22	0.24	-0.26	0.17

Source: Powell and Chaloupka, *University of Chicago Press,* 2011

Evidence from NLSY79: Price Elasticities of Child BMI by SES

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

* Denotes statistical significance with p-value ≤ 0.05

Source: Powell and Bao, *Economics of Human Biology,* 2009

Evidence from NLSY97: Fast Food Price BMI Elasticities: Individual-level Fixed Effects Model for Youths

Fast Food Price Elasticity of BMI	All	By Parental Income			By Mother's Education	
	Full Sample	Low Income	Middle Income	High Income	High School or Less	Some College or More
Price of Fast Food	-0.0782**	0.0658	-0.3130***	0.0547	-0.1338***	-0.0310

Source: Powell, *Journal of Health Economics,* 2009

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.

Soda Taxes: Consumption and Weight Outcomes

Objectives, Data and Models

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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 < soda tax rate $\leq 4\%$
    c. 4% < soda tax rate $\leq 5\%$
    d. 5% < 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

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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.

Soda Taxes and Adolescents' Weight

Monitoring the Future

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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

	Grocery Store Soda Tax Rate	Presence of Grocery Store Tax	Disfavored Grocery Soda Tax Status	Disfavored Grocery Soda Tax Amount	Vending Machine Soda Tax Rate	Presence of Soda Vending Machine Tax
Full Model	0.0131	0.0638	0.0735	0.0124	0.0110	0.0514
By Weight Status						
At Risk of Overweight	-0.0058	-0.0252	-0.0337	-0.0054	-0.0060*	-0.0210
Not at Risk	0.0165	0.0809	0.0993	0.0166	0.0142	0.0665
By Grade						
8th Grade	0.0031	0.0429	0.0373	0.0043	0.0070	0.0590
10th Grade	0.0241	0.0997	0.1117	0.0212	0.0216	0.0873
12th Grade	0.0075	0.0400	0.0342	0.0043	-0.0101	-0.0478
By Parents' Education						
Some College	0.0160	0.0948	0.0985	0.0156	0.0146	0.0845
Less than College	0.0067	-0.0134	0.0003	0.0033	0.0017	-0.0354

Source: Powell, Chriqui, and Chaloupka, *Journal of Adolescent Health*, 2009

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.

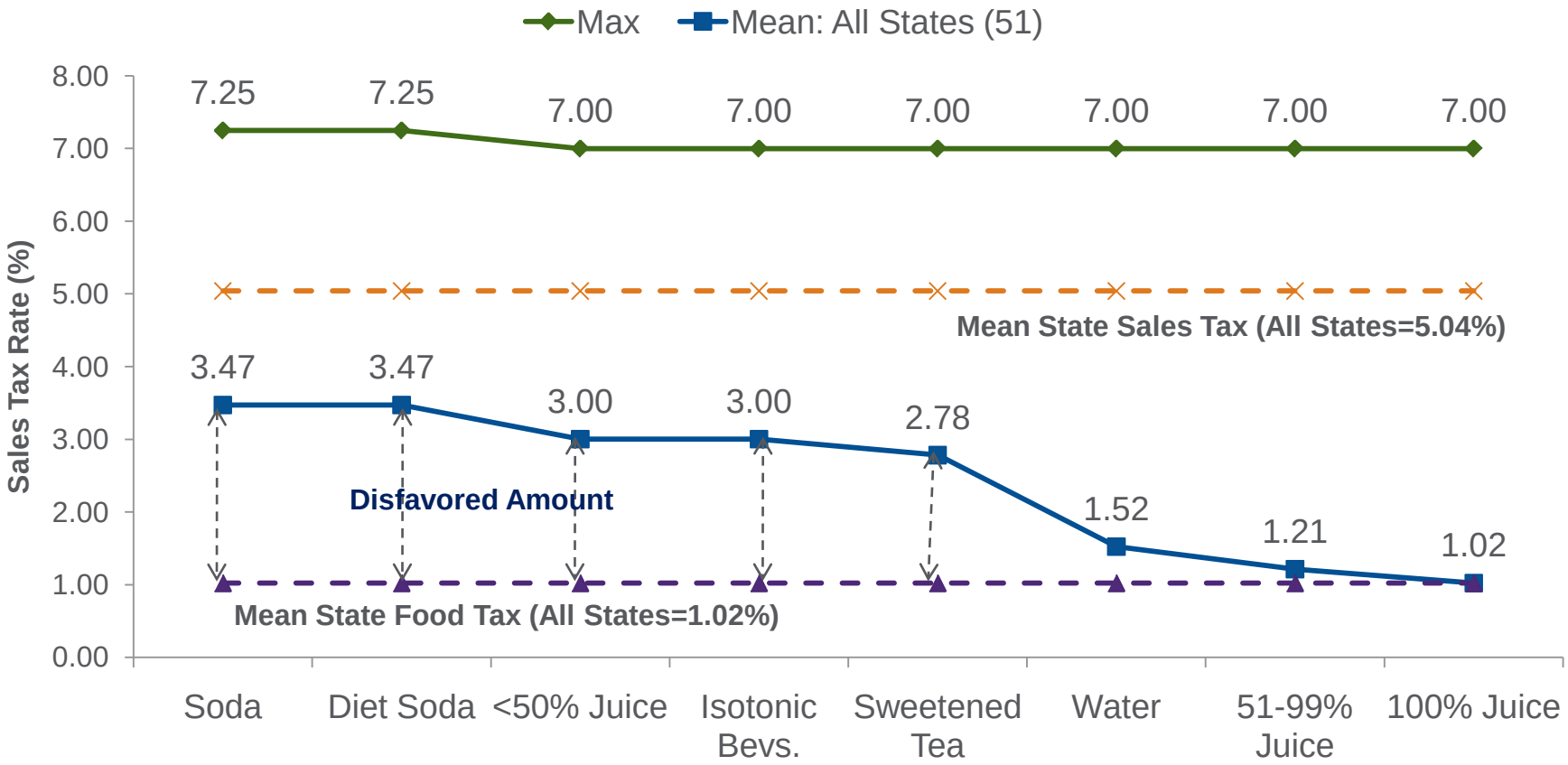
California “Healthy Purchase” pilot program where for each dollar of food stamps spent on fresh produce, participants are subsidized a portion of the cost

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**.

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

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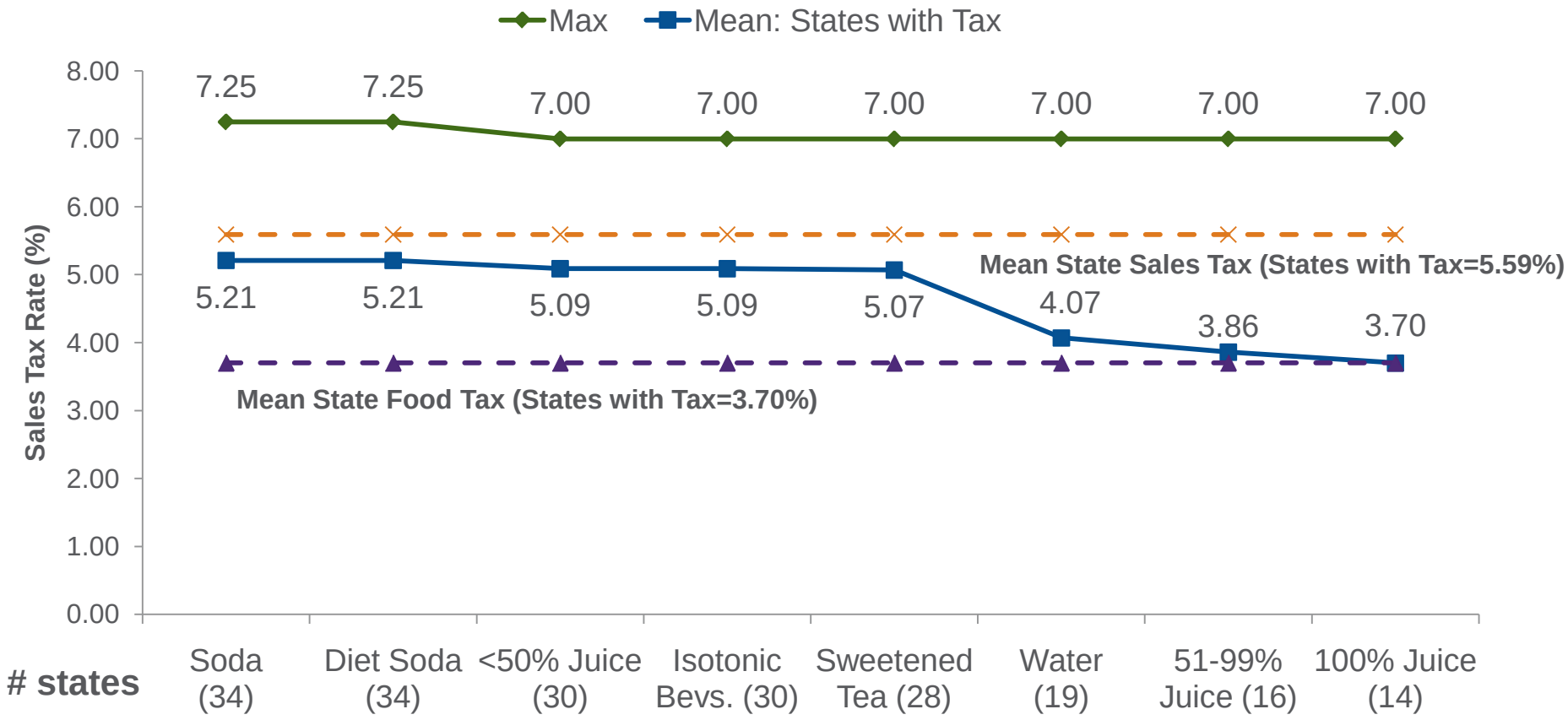
Sales Taxes on Selected Beverages, **Taxing States** (as of July 1, 2010)



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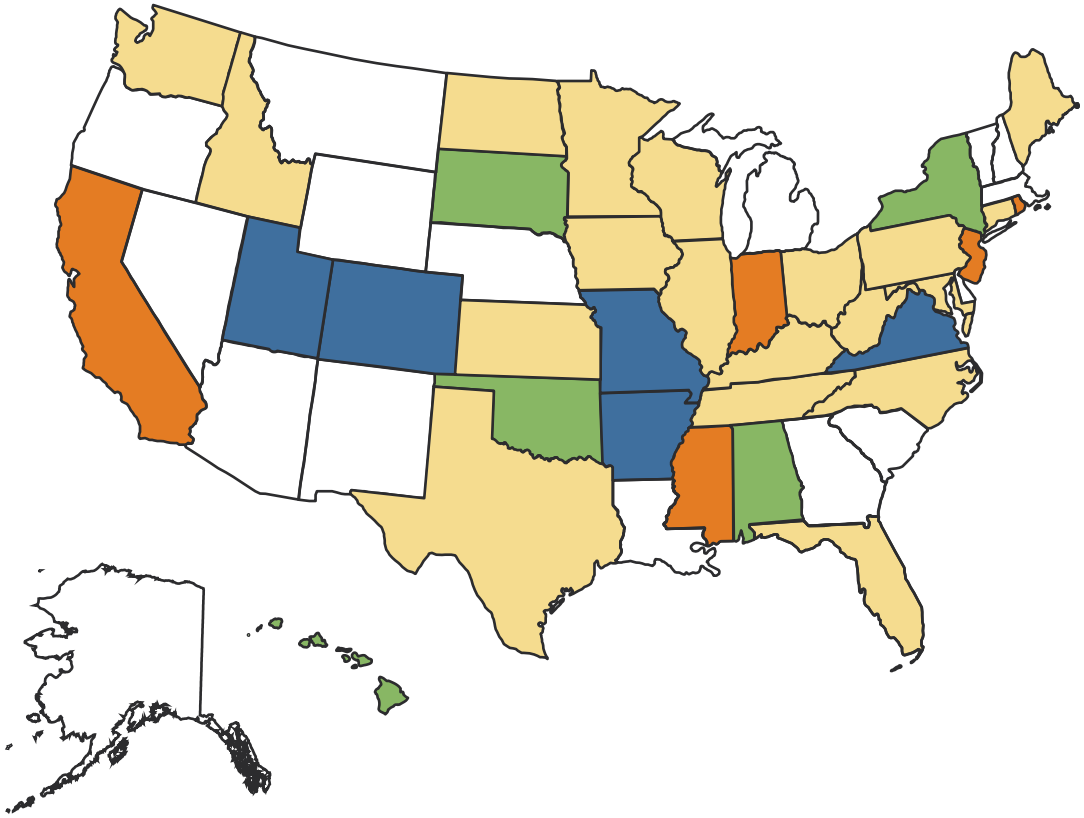
Sales taxes applied to vending machines sales, selected beverages (as of July 1, 2010)

	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

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



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%).

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

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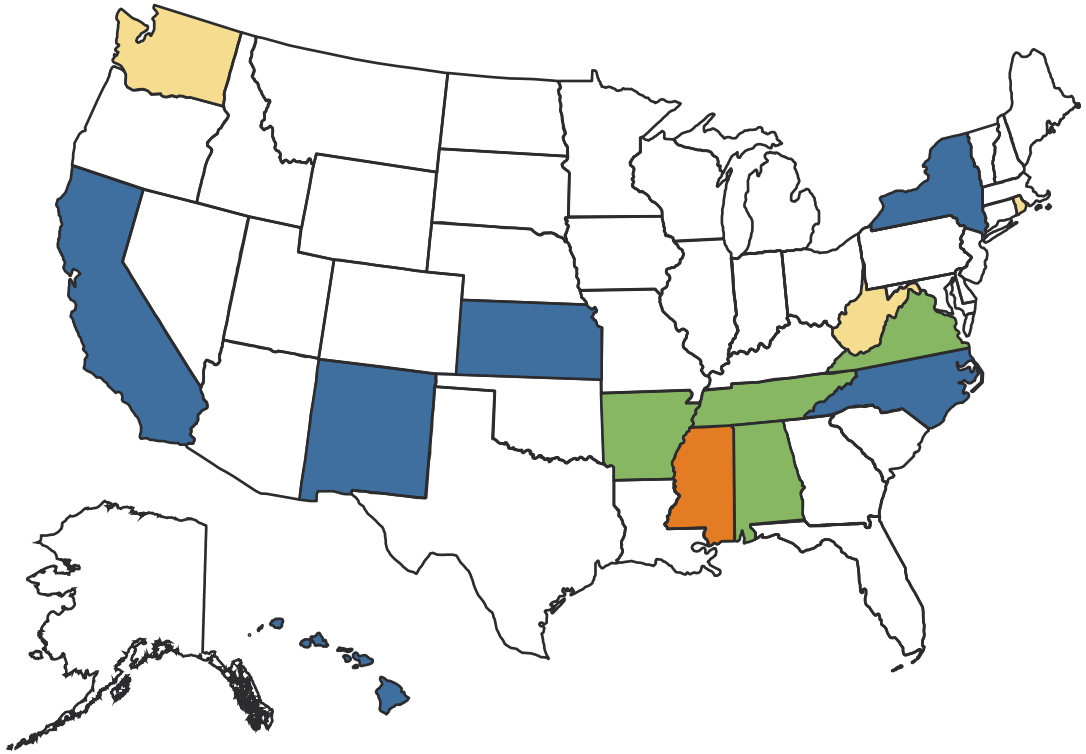
States with Non-Sales* Taxes on Selected Beverages (as of 7/1/10) or SSB-related Legislative Proposals in 2010



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.

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

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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

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