

# An Overview of the Impact of the Seattle, Washington, Sweetened Beverage Tax on Prices, Demand, Substitution, and Sugar Sold

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## Key Findings

- **Tax pass-through of the Seattle, Washington, Sweetened Beverage Tax (SBT) was 59% corresponding, on average, to a 20% increase in the price of taxed beverages.**
- **The Seattle SBT led to a sustained 22% decline in volume sold of taxed beverages up to two-years post-tax.**
- **There was no evidence of cross-border shopping in response to the tax at either one- or two-years post-tax.**
- **The tax led to moderate substitution to untaxed beverages (4-5% at one-year and two-years post-tax) and calories sold of sweets (3-4%).**
- **Accounting for substitution to untaxed beverages and sweets, the tax led to net reductions in grams of sugar sold from taxed beverages of 18% at one-year and 19% at two-years post-tax.**

Sugar-sweetened beverage (SSB) consumption is associated with chronic health problems<sup>1-3</sup> and is the leading source of added sugars intake in the U.S.<sup>4,5</sup> Among Seattle, Washington, adults, in 2017, 80.2% consumed SSBs at least once a month, with 23.2% consuming SSBs daily, and SSBs contributed 44% of total daily added sugars intake.<sup>6</sup> Further, in 2018, 19.8% of Seattle adults were obese and 7.1% had diabetes,<sup>7</sup> both conditions associated with SSB consumption.<sup>1,2</sup> Children are also affected: among 8th, 10th, and 12th grade Seattle children in 2018, 11.4% consumed SSBs daily, and 10.7% were obese.<sup>7</sup>

SSB taxes have been recognized by both national and international organizations as a potential means to reduce SSB consumption and associated health conditions.<sup>8,9</sup> SSB taxes (which may also apply to artificially sweetened beverages) are currently implemented in more than 40 countries and 7 U.S. cities.<sup>10</sup> Effective January 1, 2018, Seattle implemented its 1.75 cent per ounce Sweetened Beverage Tax (SBT) on SSBs with at least 40 calories per 12 ounces. Like other local U.S. taxes, the tax exempted milk, including flavored/sweetened milk, as well as 100% juice.

The effectiveness of SSB taxes depends on the extent to which they are passed through to prices faced by consumers and the extent to which this leads to decreases in demand. It also hinges on the extent to which substitution to untaxed beverages or foods, which may also be unhealthy and high in sugar, offsets the impact of the tax. This brief summarizes the results of four studies which used Nielsen retail scanner data to analyze the impact of the Seattle SBT on beverage prices and volume sold, substitution to untaxed beverages, sweets, and salty snacks, and net changes in grams of sugar sold from taxed beverages up to two-years post-tax, based on difference-in-differences analyses with Portland, Oregon, as a comparison site.<sup>11-14</sup>

In this brief, we summarize the study findings on the impact of the Seattle SBT. Table 1 summarizes the empirical results from two studies that examined the respective one-<sup>11</sup> and two-year<sup>12</sup> post-tax impacts of the SBT on tax pass-through, volume sold of taxed and untaxed beverages and cross-border shopping and a study<sup>13</sup> that examined substitution to sweets and salty snacks. Figure 1 shows the changes in volume sold of taxed beverages in Seattle compared to the comparison site of Portland; and, Figure 2 shows these changes by beverage size. Finally, Figure 3 shows the distribution of total grams of sugar sold pre-tax in Seattle by beverage and sweet category and for standalone sugar.<sup>14</sup> And, we summarize study<sup>14</sup> findings that examined the impact of the SBT on changes in grams of sugar sold from taxed SSBs, untaxed beverages, sweets and from standalone sugar itself, which may be added to foods and beverages. This provides evidence on the net tax impact on reducing sugar sold from SSBs, after accounting for potential substitution to other key sources of added sugars.

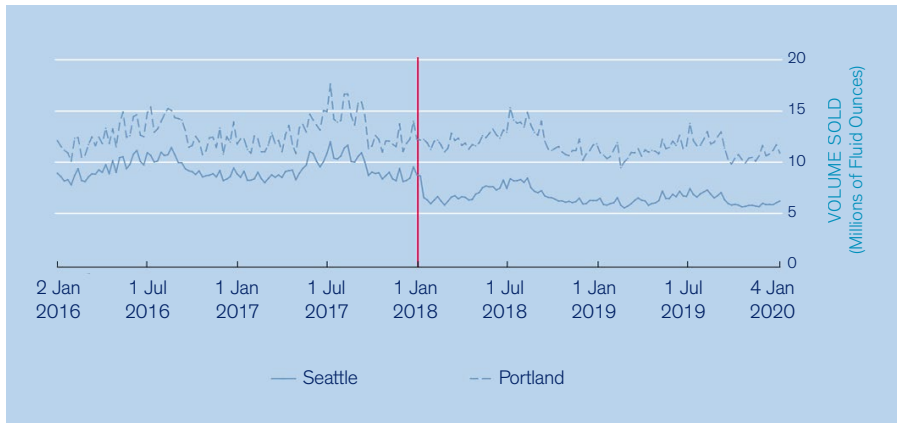
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TABLE 1 Tax Impact on Prices, Volume Sold, and Substitution		
	YEAR 1 POST-TAX	YEAR 2 POST-TAX
<b>Change (cents/ounce) in prices of taxed beverages</b>	<b>1.03</b> (0.99, 1.08)	<b>1.04</b> (0.99, 1.10)
<b>Change (%) in volume sold of taxed beverages</b>	<b>-22%</b> (-25%, -19%)	<b>-22%</b> (-25%, -18%)
<b>Change (%) in volume sold of untaxed beverages</b>	<b>+4%</b> (1%, 8%)	<b>+5%</b> (1%, 10%)
<b>Change (%) in sales of sweets</b>	<b>+4%</b> (3%, 5%)	<b>+6%</b> (5%, 7%)
<b>Change (%) in calories sold of sweets</b>	<b>+3%</b> (2%, 5%)	<b>+4%</b> (2%, 5%)

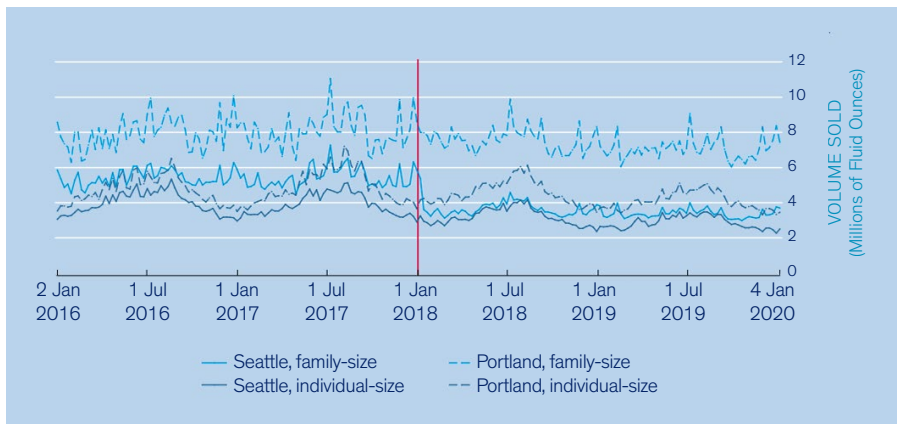
Note: 95% confidence intervals are shown in parentheses.

**FIGURE 1** Volume Sold of Taxed Beverages in Seattle, Washington, and Portland, Oregon, Two-Years Pre- and Post-Tax Implementation<sup>12</sup>



Note: First published in the *Journal of Public Health Policy*, 2021, <https://doi.org/10.1057/s41271-021-00308-8> by Springer Nature.

**FIGURE 2** Volume Sold of Family-Size and Individual-Size Taxed Beverages in Seattle, Washington, and Portland, Oregon, Two-Years Pre- and Post-Tax Implementation<sup>12</sup>



Notes: Individual-size beverages: single items at most 1 liter in volume. Family-size beverages: single items greater than 1 liter or multi-packs of any size. First published in the *Journal of Public Health Policy*, 2021, <https://doi.org/10.1057/s41271-021-00308-8> by Springer Nature.

## Results

### Tax pass-through:

- Following the implementation of the Seattle SBT, the price of taxed beverages rose, on average, by 1.03–1.04 cents per ounce at one-year and two-years post-tax.
- This corresponded to a 59% tax pass-through rate; and, based on pre-tax mean prices, a 20% increase in the price of taxed beverages.

### Changes in Demand:

- The Seattle SBT led to an immediate, sustained 22% reduction in taxed beverage volume sold up to two-years post-tax.
- The Seattle SBT led to a sustained 29–31% decline in volume sold of family-size taxed beverages and 10% decline in volume sold of individual-size taxed beverages up to two-years post-tax.
- The largest decline was in volume sold of family-size taxed soda, which fell by 36% at both one-year and two-years post-tax relative to the pre-tax period.

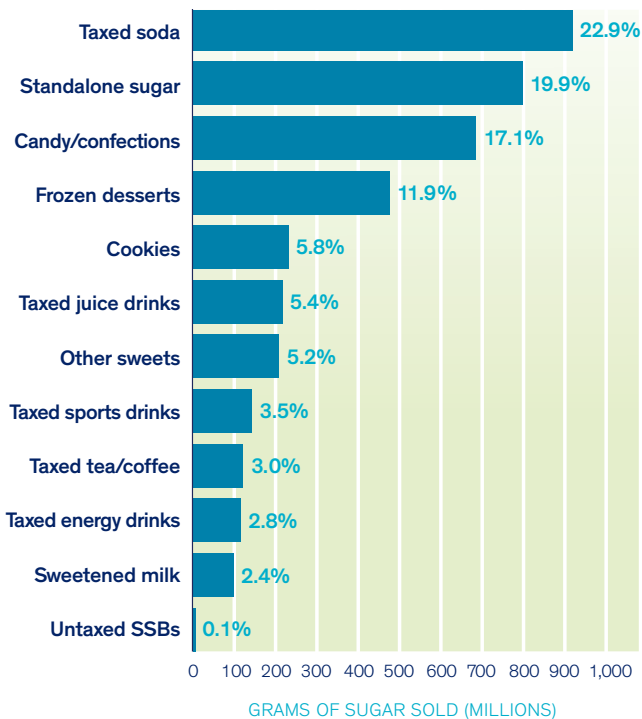
### Substitution:

- There was moderate substitution to untaxed beverages of 4–5%.
- Sales of sweets increased by 4–6% up to two-years post-tax, corresponding to a 3–4% increase in calories of sweets sold. There was no evidence of changes in sales of salty snacks.

### Cross-border shopping:

- There was no evidence of cross-border shopping for taxed beverages up to two-years post-tax.

**FIGURE 3 Sources of Sugar in Seattle, Washington, One-Year Pre-Tax Implementation<sup>14</sup>**



Note: First published in JAMA Network Open, 2021, <https://doi.org/10.1001/jamanetworkopen.2021.32271>.

### Distribution of Sugar Sold:

- In the year prior to tax implementation, nearly a quarter (22.9%) of sugar sold in Seattle came from taxed soda. SSBs combined contributed approximately 40% of sugar sold.
- The next highest contributors were sugar sold on its own (19.9%), candy/confections (17.1%), and frozen desserts (11.9%).

### Changes in sugar sold from taxed SSBs:

- Sugar sold from taxed SSBs fell by 23% at both one-year and two-years post-tax relative to the pre-tax period.
- Sugar sold from untaxed SSBs (with <40 calories/12 ounces) and sweetened milk increased by 4% at one-year post-tax but was unchanged relative to the pre-tax period at two-years post-tax.
- Sugar sold from sweets increased by 4% at both one-year and two-years post-tax relative to the pre-tax period.
- Sugar sold from standalone sugar (e.g., for adding to beverages or foods) was unchanged at both one-year and two-years post-tax.
- There was a net reduction in grams of sugar sold from taxed SSBs of 18% at one-year and 19% at two-years post-tax after accounting for potential substitution to untaxed beverages, sweets, and standalone sugar.

## Data and Methods

Full details on the data and methods are provided in the papers summarized in this brief; a summary is provided here. Analyses utilized Nielsen retail scanner data covering sales at all mass merchandisers, supermarkets, and grocery, drug, convenience (including non-chain), and dollar stores in Nielsen's sample, which was estimated to cover 45% of food store beverage volume sold in Seattle. Data covered Seattle, Portland, and two-mile border areas around both sites for two years before and two years after tax implementation. Weekly data were obtained on unit and dollar sales of non-alcoholic beverage, sweet, salty snack, and standalone sugar universal product codes (UPCs) in each site.

UPC characteristics and nutritional data were obtained from the Nielsen data and from Label Insight, the United States Department of Agriculture Food Composition Databases, and Internet research by a registered dietitian and research assistants. Beverage volume sold was computed by multiplying units sold by the volume of each unit in fluid ounces; beverage price per ounce was computed by dividing dollar sales by volume sold; and beverage grams of sugar sold were computed by multiplying volume sold by grams of sugar per ounce. Calories and grams of sugar sold of sweets were computed by multiplying units sold by the number of calories or grams of sugar per serving times the number of servings per unit. Grams of sugar sold were computed for standalone sugar by multiplying the number of units sold by the grams of sugar per unit based on product weight. The sugar measure included all

sugars for sweets and most beverages but was restricted to added sugars for sweetened milks.

The samples were balanced to only include UPCs sold in both sites in both the pre- and post-tax period, and for analyses of calories and sugar sold of sweets were limited as nutrition information was only researched for the top 80% of non-store brand sweet UPCs. Analytical samples included 3,803-4,065 beverage UPCs for analyses of one-year post-tax impacts on beverage prices and volume sold in Seattle and its border area and 3,247-3,405 for analyses of two-year post-tax impacts; 6,696 sweet and 2,416 salty snack UPCs for analyses of changes in sales; 2,054 sweet UPCs for analyses of changes in calories sold; and 1,565 beverage, 2,054 sweet, and 81 standalone sugar UPCs for analyses of changes in grams of sugar sold.

All analyses used difference-in-differences models comparing changes over time in Seattle (or its border area) to changes over time in Portland (or its border area). Portland was selected as the comparison site based on Mahalanobis distance matching on several demographic and socioeconomic variables. All studies reported that parallel trend assumptions were satisfied for the respective outcomes. Difference-in-differences analyses were conducted with Poisson models, or linear regression models for analyses of pass-through, with robust standard errors clustered on UPC; details on control variables are included in the original papers. Pass-through analyses were weighted to reflect the pre-tax volume sold of each UPC in Seattle, Portland, and their two-mile border areas. Analyses were conducted in Stata/SE 15.1.

## Conclusions

The overview of results on the impacts of the Seattle SBT provided in this brief, based on studies that analyzed retail scanner data using difference-in-differences models, indicates that the 1.75 cent per ounce SBT was partially passed on to consumers and that it led to a sustained two-year post-tax 22% reduction in volume sold of taxed SSBs in Seattle. Unlike study findings from other U.S. jurisdictions,<sup>15-18</sup> the impact of the Seattle SBT on demand was not dampened by cross-border shopping. Study results revealed moderate substitution with a 5% increase in volume sold of untaxed beverages and a 4% increase in calories sold from sweets at two-years post-tax, but no substitution to salty snacks. A comprehensive assessment of changes in sugar sold from products that are the key contributors to added sugars intake in the U.S. diet revealed a net 19% two-year post-tax reduction in grams of sugar sold from taxed SSBs after accounting for changes in sugar sold from untaxed beverages, sweets, and standalone sugar. Taken together, the results summarized in this brief suggest that the Seattle SBT may effectively yield permanent reductions in the demand for SSBs and related added sugars intake and health harms.

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## SUGGESTED CITATION

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