Evidence on the Impacts of the Seattle Sweetened Beverage Tax

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Empirical Evidence on Impacts of Seattle SSB Tax

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FI SEVIER JOC	anar nonapaga. www.sizeris.com/	Impact of a sugar-sweetened beverage tax two-year	Salty Snacks	of the Seattle Sweetened Beverage Tax			Tax on substitution to alcoholic beverages
		post-tax implementation in Seattle, Washington, Ur	Vanessa M Oddo,1 Julien Leider,2 and Lisa M Powell2,3	Lisa M. Powall, PhD; Julian Laider, MA; Vanessa M. Oddo, PhD			0
The impact of Seattle's Sy	weetened Beverage Tax on b	States					Lisa M. Powello ^{1,2} *, Julien Leidero ²
volume sold	_		¹ Department of Kinesiology and Natrition, College of Applied Health Sciences, Unive for Health Research and Policy, University of Illnois Chicago, Chicago, IL, USA, and School of Public Health, University of Illnois Chicago, Chicago, IL, USA	Abstract	Key		 Division of Health Policy and Administration, School of Public Health, University of Illinois Chicago, Chicago, IL, United States of America, 2 Institute for Health Research and Policy, University of Illinois
Lisa M. Powell ^{a,*} , Julien Leider ¹	b	Lisa M. Powell ^{1,2} · Julien Leider ²	School of Public Health, University of Ilinon Chicago, Chicago, IL, USA	IMPORTANCE Adults and children routinely exceed recommended intake amounts of added sugars	Ques		Chicago, Chicago, IL, United States of America
⁴ Division of Health Policy and Administration, School o ¹⁶ Institute for Health Research and Policy, University of	of Public Health, University of Hinois at Chicago, Chicago, IL, U (Hinois at Chicago, Chicago, IL, United States		ABSTRACT	established by dietary guidelines. Taxes are used as a policy tool to reduce demand for sugar- sweetened beverages (SSBs) given consumption-related adverse health outcomes but may induce	taxed		*powell@ub.edu
	rented to Crickinge Contago, in control action	Accepted: 19 October 2021 © The Author(s), under exclusive licence to Springer Nature Limited 2021	Background: Sugar-sweetened beverage (SSB) taxes may have broad		sugar		
ARTICLE INFO	ABSTRACT		substitution of SSBs with untaxed sweets and/or salty snacks could offs these policies.	OBJECTIVE To examine the extent to which changes in grams of sugar sold from taxed beverages	2018		Abstract
Article history: Received 15 September 2019	On January 1, 2018 the city of Seattle, WA, impler Tax (SBT)on sugar-sweetened beverages with at 1	Abstract	these policies. Objectives: To test whether there were changes in sales and calories s	may be offset by changes in grams of sugar sold from untaxed beverages, sweets, and stand-alone	Bava	Check for updates	
Received in revised form 19 January 2020 Accepted 20 January 2020	product code-level store scanner data and used differences (DID) study design to assess the imp	This study examines longer-run impacts of the Seattle, Washington	tax in Seattle, Washington, at 12 and 24 months post-tax implementation Methods: On 1 January 2018, the City of Seattle levied a 1.75 cents per o	sugar after the implementation of the Seattle, Washington, Sweetened Beverage Tax (SBT) on January 1, 2018.	Find		Introduction
Available online 21 January 2020	volume sold of taxed beverages in Seattle and in volume sold of untaxed beverages (substitution) r	erage Tax (SBT) on beverage prices, volume sold, and cross-bore use a difference-in-differences estimation approach, drawing on	SSBs. We utilized universal product code-level store scanner data and em		differ		Taxes are increasingly used as a policy tool aimed at reducing consumption of sugar-sweet-
JEL classification: 112	The DID results showed that, on average, in th beverages more by 1.09 cents per or (p < 0.001) cor	code-level store scanner data on taxed and untaxed beverages one	assess the impacts of the tax on the changes in 1) sales of sweets and sal in Seattle relative to changes in its comparison site of Portland, Oregon, a	DESIGN, SETTING, AND PARTICIPANTS This study used difference-in-differences analyses to examine changes in grams of sugar sold from taxed and untaxed products in Seattle compared with	accou	OPEN ACCESS	ened beverages (SSBs), given their association with adverse health outcomes including type 2 diabetes, obesity and cardiovascular disease. However, a potential unintended con-
its Accounts:	of taxed beverages fell, on average, by 22% (p < 0 the tax. Volume sold of taxed beverages fell t	two-year post-tax with Portland, Oregon, as the comparison site. T	Results: In the 12 months post-tax, sales of sweets increased by 49	Portland, Oregon, at year 1 and year 2 post tax. This study used Nielsen scanner data from	stand	Citation: Powell LM, Leider J (2022) Impact of the	sequence of such a policy could be that the tax induces substitution to alcoholic beverages.
Super-sweetenand beverag m SSB tax	beverages (31% versus 10%) and fell to a greater types. Moderate substitution to untaxed bever	prices of taxed beverages increased by 1.04 cents per ounce (59% rate). Volume sold of taxed beverages fell by 22%. Declines were	95% CI, 1.03–1.05] in Seattle relative to the changes in Portland; at 24 m	supermarkets and mass merchandise as well as grocery, drug, convenience, and dollar stores on unit sales and measurements for beverage and food product universal product codes (UPCs) for each	taxed	Seattle Sweetened Beverage Taxon substitution to alcoholic beverages. PLoS ONE 17(1): e02/625/78.	
Tax pana-through Tax policy	increased by 4% (p < 0.05). The results revealed taxed beverages in the 2-mile border area of Sea	size (29%) compared to individual-size (10%) beverages; particula	(RIRR, 1.06; 95% CI, 1.05–1.07) relative to the pretax period. There was n 12 months (RIRR, 1.00; 95% CI, 0.99–1.01) or 24 months (RIRR, 1.00; 95%)	site for the pretax period (January 8-December 30, 2017) and the corresponding weeks in year 1 post	18%)	https://doi.org/10.1371/journal.p.one.0262578	ington, Sweetened Beverage Tax (SBT) on volume sold of aboholic beverages.
Facal policy Gross-border shopping	avoidance in the form of cross-border shopping	decrease for family-size compared to no change for individual-siz	sweets increased by 3% (RIRR, 1.03; 95% CI, 1.02-1.05) in Seattle comp	tax (2018) and in year 2 post tax (2019). Nutritional analyses assessed grams of sugar for each UPC. The analytical balanced sample included 1326 taxed beverage UPCs, 239 untaxed beverage UPCs,	post	Edillor: Matteo Rota, Universita degli Studi di Brescia, ITALY	Methods
		change in volume sold of taxed beverages in Seattle's 2-mile bore ing no cross-border shopping. Overall, we found a sustained imp	by 4% (RIRR, 1.04; 95% Cl, 1.02–1.05) at 24 months after implementation Conclusions: There was modest substitution of SSBs for sweets in Se	2054 sweets UPCs, and 81 stand-alone sugar UPCs. Statistical analysis was performed from January	that :	Received: May 10, 2021	A difference-in-differences estimation approach was used drawing on universal product
1. Introduction	contributor of ad	SBT two-year post-tax implementation suggesting that sugar-sw	this increase in sales and calories sold is not likely to offset previously id	to August 2021.	may	Accepted: December 29, 2021	code-level food store scanner data on beer (N= 1059) and wine (N= 2655) products one- year pre-tax (February-November, 2017) and one and two-years post-tax (February-
Obesity continues to be a significa	intake is above r and risk factor for non- and Krebs-Smith	taxes may yield permanent reductions in demand for sugary beve ated health harms.	for taxed beverages in Seattle. Thus, SSB taxes are a promising policy to: J Nutr 2021;00:1-8.	EXPOSURES Implementation of the Seattle SBT.	swee	Published: January 18, 2022	November, 2018 and 2019) with Portland, Oregon, as the comparison site.
communicable disease burden in the Uni rates among adults in the U.S. increased o	ited States (U.S.). Obesity Services and U.S.	ace nearth harms.	Keywords: sugar-sweetened beverages, SSB tax, obesity policy, nut	MAIN OUTCOMES AND MEASURES Changes in grams of sugar sold from taxed beverages, untaxed		Copy ight: © 2022 Powell, Leider. This is an open access article distributed under the terms of the	
33,7% in 2007-08 to 39.6% in 2015-16; an children aged 2-19 years increased sligh	d, rates of obesity among million were adu	Keywords Sugar-sweetened beverage taxes - Health taxes - Fiscal p	the provider auguror menoring benefities, one say, one say pointy, not	beverages, sweets, and stand-alone sugar.	+ Sup	Creative Commons Attribution Ligense, which permits unrestrided use, distribution, and	Results At two-years post-tax implementation, volume sold of beer in Seattle relative to Portland
from 16.8%-18.5%, although that chan significant (Hales et al., 2018). Parallel to	ge was not statistically consumption is		Introduction	RESULTS At both year 1 and year 2 post tax in Seattle compared with Portland, grams of sugar sold	Authora listed at	reproduction in any medium, provided the original author and source are credited.	increased by 7% (ratio of incidence rate ratios [RIRR] = 1.07, 95% CI:1.00,1.15), whereas
percent of U.S. national medical expendit	tures for treating obesity- disease, dental c	Introduction	The overconsumption of calories is an important determinant of	from taxed beverages decreased 23% (year 2 posttax ratio of incidence rate ratios [RIRR] = 0.77; 95% Cl, 0.73-0.80). Sugar sold from untaxed beverages increased at year 1 post tax by 4%		Data Availability Statement: The data cannot be	volume sold of wine decreased by 3% (RIRR = 0.97, 95% CI:0.95, 1.00). Overall alcohol
related illness in adults rose from 6.13% in increase of 29% (Biener et al., 2018). Alth	ough energy intake from In line with th	Sugar-sweetened beverage (SSB) consumption is a key contribut	obesity, which affects 40% of adults and 20% of children in the United States (1-3). Sugar-sweetened beverages (SSB) are a key	(RIRR = 1.04; 95% CI, 1.00-1.07) with no change at year 2 post tax. Sugar sold from sweets increased		shared publicly because the data were purchased under a contract from a third party and authors do	(both beer and wine) volume sold increased in Seattle compared to Portland by 4% (RIRR = 1.04, 95% CI:1.01,1.07) at one-year post-tax and by 5% (RIRR = 1.05, 95% CI:1.00,1.10) at
sugar-sweetened beverage (SSB) consum children aged 2–19 years and by 45% ar	mong adults (≥20 years) worldwide and	ars intake [1, 2] and is linked to adverse health outcomes includi	contributor to individuals' total caloric intake and the related obesity endemic, which is estimated to account for 18% of adult	by 4% at both year 1 and year 2 post tax (year 2 posttax RIRR = 1.04; 95% CI, 1.03-1.06). There were no changes in stand-alone sugar sold.		not have permission to share the data. However, the data may be purchased from Nielsen (www.	two-years post-tax. The implied SSB cross-price elasticities of demand for beer and wine,
from 2003-04 to 2015-16 (Marriott et al., and 61% of U.S. youths till consumed at lea	astone SSB on a given day tionally by the	tes, obesity, and cardiovascular disease [3-6]. Policies that le	mortality and \$147 billion to \$210 billion per year in medical costs in the United States (4-6), From 1977 to 2001, caloric			nielsen.com). The authors had no special access	respectively, were calculated to be 0.35 and -0.15.
in 2013-14 (Bleich et al, 2018). Addition	led to the imple	reductions in added sugars intake are critical for achieving long	intake from soft drinks and fruit drinks increased by 135%, and recent estimates suggest that on average, US adults and youth	CONCLUSIONS AND RELEVANCE This study using difference-in-differences analysis found a net 19% reduction in grams of sugar sold from taxed SSBs at year 2 post tax after accounting for changes		privileges to the proprietary retail scanner data that others would not have.	Conclusions
	than 40 countrie (though subsequ		consume approximately 7% of their total calories from SSBs	in sugar sold from untaxed beverages, sweets, and stand-alone sugar. These results suggest that SSB		Funding: This study was supported by a grant	There was evidence of substitution to beer following the implementation of the Seattle SSB
 Corresponding sut hor at: Health Policy and Adr 	ministration (MC 923), Rm. 777, Carolina, 2019).		(7–9). Evidence suggests that decreasing SSB consumption will	taxes may effectively yield permanent reductions in added sugars sold from SSBs in food stores.		(grant number 49255) from Boomberg	tax. Configured monitoring of potential unintended outcomes related to the implementation

entity of Hinois at Chicago, 1603W Taylor St, Chicago, School of Public Health, University of Illino is at Chica II.60612-4393, United States. E-mail address: powell@uic.edu (LM, Powell). evaluated not o potential 'unint

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reduce the prevalences of obesity and obesity-related diseases (10). SSB taxes have emerged as a promising intervention to improve health by reducing caloric intake from SSBs. Prior studies demonstrated that the implementation of SSB taxes in

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Philanthropies' Obesity Prevention Initiative (www. bicomberg.org). The contents of this publication of SSB taxes is needed in future tax evaluations. do not neoesarily reflect the views or policies of

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Impact of the Seattle SBT on Prices: Tax Pass-through

Tax Impact on Beverage Prices and Related Tax Pass-though

	Year 1 Post-tax	Year 2 Post-Tax
Change in prices (¢/oz)	1.03 (0.99, 1.08)	1.04 (0.99, 1.10)
Tax Pass-through	59%	59%

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 passthrough rate; and, based on pre-tax mean prices, a 20% increase in the price of taxed beverages.

Sources: Powell LM & Leider J. (2020). The impact of Seattle's sweetened beverage tax on beverage prices and volume sold. Economics and Human Biology. 37:100856 Available online: <u>https://doi.org/10.1016/j.ehb.2020.100856</u>

Powell, L.M. and Leider, J., (2021). Impact of a sugar-sweetened beverage tax two-year post-tax implementation in Seattle, Washington, United States. Journal of Public Health Policy, 42:574-588. Available online: <u>https://doi.org/10.1057/s41271-021-00308-8</u>

Comparison with SSB Tax Pass-through in U.S.

FIGURE 1 Tax Pass-through Estimates and Meta-analysis Results				
Study	Site	Est [95% CI]		
Falbe 2015 ¹²	Berkeley	0.47 [0.25; 0.69]		
Cawley 201713	Berkeley 🗕	0.43 [0.28; 0.58]		
Silver 2017 ⁵	Berkeley	0.49 [-0.37; 1.35]		
Silver 2017 ⁵	Berkeley -	0.65 [0.23; 1.07]		
Zhang 2021 ¹⁴	Berkeley +	0.10 [0.06; 0.14]		
Rojas 2021 ¹⁵	Berkeley 🗕	0.16 [-0.01; 0.34]		
Cawley 2021 ¹⁶	Boulder -	0.53 [0.34; 0.72]		
Cawley 2021 ¹⁶	Boulder	0.62 [0.23; 1.00]		
Cawley 2021 ¹⁶	Boulder	0.72 [0.50; 0.94]		
Powell 2020 ¹⁷	Cook County +	1.13 [1.01; 1.25]		
Powell 2020 ¹⁸	Cook County +	1.19 [1.17; 1.21]		
Marinello 20207	Oakland	0.50 [-0.01; 1.01]		
Marinello 2020 ⁸	Oakland	0.60 [-0.86; 2.06]		
Cawley 202019	Oakland -	0.61 [0.39; 0.83]		
Falbe 2020 ²⁰	Oakland —	0.92 [0.28; 1.56]		
Léger 2021 ²¹	Oakland •	0.49 [0.45; 0.53]		
Leider 2021 ⁴	Oakland	0.50 [0.05; 0.95]		
Cawley 2018 ²²	Philadelphia -	0.55 [0.22; 0.89]		
Roberto 20196	Philadelphia -	0.68 [0.24; 1.13]		
Cawley 202023	Philadelphia -	1.05 [0.82; 1.29]		
Bleich 2020 ²⁴	Philadelphia 🕂	1.21 [1.01; 1.39]		
Seiler 2021 ²⁵	Philadelphia •	0.97 [0.94; 0.99]		
Falbe 2020 ²⁰	San Francisco	1.00 [0.35; 1.65]		
Powell 2020 ²⁶	Seattle	0.59 [0.57; 0.62]		
Saelens 202027	Seattle -	0.89 [0.77; 1.01]		
Jones-Smith 2020 ²⁸	Seattle +	0.90 [0.81; 1.00]		
		0.70 [0.53; 0.86]		
Notes Objective states and				
Notes: CI: confidence interval Est: estimate	-2 -1 0 1 2			

SSB taxes increase prices:

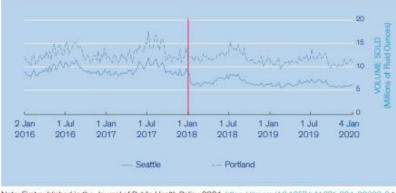
On average, tax pass-through of local U.S. SSB taxes has been 70%, although there has been substantial heterogeneity across studies.

Estimates of tax pass-through were similar, on average, in jurisdictions with lower (i.e., 1¢/oz) compared to higher (i.e., > 1¢/oz) tax rates.

Source: Powell LM, Marinello S, Leider J. <u>A Review and Meta-analysis of Tax Pass-through of Local Sugar-Sweetened Beverage Taxes</u> in the United States. Research Brief No. 120.

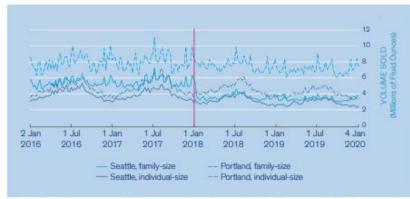
Impact of Seattle SBT on Demand: Evidence on Volume Sold





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





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, <u>https://doi.org/10.1057/s41271-021-00308-8</u> by Springer Nature.

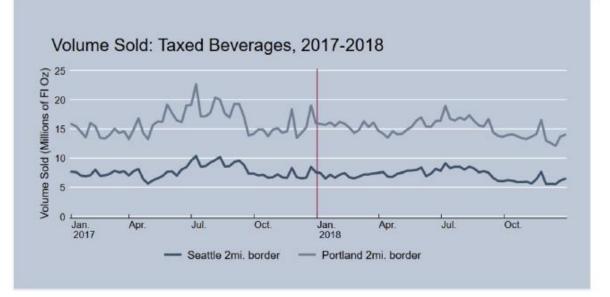
Changes in Volume Sold:

- Immediate, **sustained 22% reduction** in taxed beverage volume sold up to 2-years post-tax.
- Estimated price elasticity of demand was -1.1.
- Sustained 29-31% decline in volume sold of familysize taxed beverages and 10% decline in volume sold of individual-size taxed beverages up to 2-years post-tax.
- The largest decline was in volume sold of family-size taxed soda, which fell by 36% at 1- and 2-years post-tax relative to the pre-tax period.

Sources: Powell LM & Leider J. (2020). The impact of Seattle's sweetened beverage tax on beverage prices and volume sold. Economics and Human Biology. 37:100856 Available online: <u>https://doi.org/10.1016/j.ehb.2020.100856</u>

Powell, L.M. and Leider, J., (2021). Impact of a sugar-sweetened beverage tax two-year post-tax implementation in Seattle, Washington, United States. Journal of Public Health Policy, 42:574-588. Available online: <u>https://doi.org/10.1057/s41271-021-00308-8</u>

Impact of Seattle SBT on Cross-border Shopping: Evidence on Volume Sold



Changes in Volume Sold in the border area:

 No evidence of cross-border shopping following the implementation of the Seattle SBT through 2-years post-tax.

Fig. 3. Volume Sold of Taxed Beverages in the 2-mile Border Area of Seattle, WA, and Portland, OR, One-year Before and After Tax Implementation.

Sources: Powell LM & Leider J. (2020). The impact of Seattle's sweetened beverage tax on beverage prices and volume sold. Economics and Human Biology. 37:100856 Available online: <u>https://doi.org/10.1016/j.ehb.2020.100856</u>

Powell, L.M. and Leider, J., (2021). Impact of a sugar-sweetened beverage tax two-year post-tax implementation in Seattle, Washington, United States. Journal of Public Health Policy, 42:574-588. Available online: <u>https://doi.org/10.1057/s41271-021-00308-8</u>

Comparison with Impact of SSB Taxes Demand in the U.S.: Evidence on Consumption, Purchases and Volume Sold

Study	Site	Est [95% CI]
Falbe 2016 ¹⁴	Berkeley, CA -	-0.24 [-0.42; -0.01]
Silver 2017 ¹⁵	Berkeley, CA	-0.10 [-0.10; -0.09]
Silver 2017 ¹⁵	Berkeley, CA	-0.20 [-0.61; 0.21]
Taylor 2019 ¹⁶	Berkeley, CA -	-0.24 [-0.43; 0.01]
Taylor 2019 ¹⁶	Berkeley, CA	-0.12 [-0.16; -0.08]
Lee 2019 ¹⁷	Berkeley, CA	-0.44 [-0.65; -0.24]
Rojas 2021 ¹⁸	Berkeley, CA	0.00 [-0.16; 0.20]
Powell 2020 ¹⁹	Cook County, IL +	-0.27 [-0.30; -0.25]
Powell 2020 ²⁰	Cook County, IL 🗕	-0.26 [-0.34; -0.16]
Cawley 2020 ²¹	Oakland, CA	-0.59 [-1.44; 0.26]
Cawley 2020 ²¹	Oakland, CA	-0.41 [-0.94; 0.13]
Cawley 2020 ²¹	Oakland, CA	0.12 [-0.23; 0.48]
Léger 202122	Oakland, CA	-0.14 [-0.16; -0.11]
Zhong 2018 ⁹	Philadelphia, PA	-0.20 [-0.50; 0.11]
Roberto 2019 ⁸	Philadelphia, PA	-0.35 [-0.66; -0.04]
Cawley 201923	Philadelphia, PA	-0.62 [-1.21; -0.03]
Cawley 2019 ²³	Philadelphia, PA -	-0.08 [-0.30; 0.14]
Cawley 201923	Philadelphia, PA	-0.12 [-0.42; 0.19]
Zhong 2020 ¹⁰	Philadelphia, PA	-0.07 [-0.44; 0.30]
Bleich 2020 ²⁴	Philadelphia, PA	-0.40 [-0.67; -0.13]
Lawman 2020 ²⁵	Philadelphia, PA -	-0.03 [-0.26; 0.21]
Cawley 2020 ²⁶	Philadelphia, PA	-0.28 [-0.43; -0.13]
Seiler 2021 ²⁷	Philadelphia, PA	-0.46 [-0.62; -0.30]
Powell 2020 ²⁸	Seattle, WA	-0.22 [-0.25; -0.19]
Saelens 2020 ²⁹	Seattle, WA -	0.07 [-0.33; 0.45]
Saelens 2020 ²⁹	Seattle, WA	0.12 [-0.24; 0.47]
		-0.20 [-0.25; -0.14

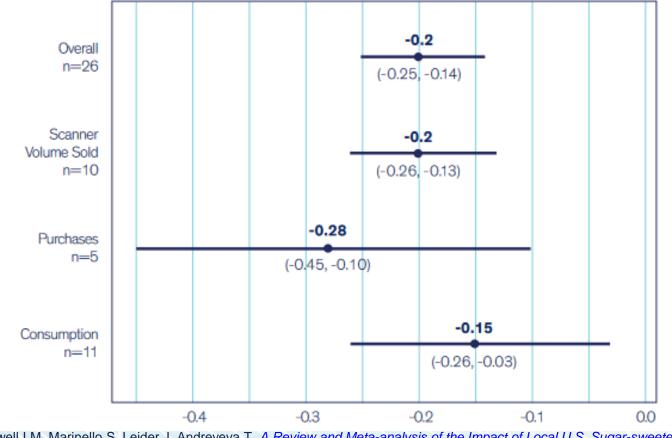
SSB taxes reduce demand:

On average, following the implementation of local U.S. SSB taxes, demand for SSBs fell by 20%, with substantial heterogeneity across studies.

Source: Powell LM, Marinello S, Leider J, Andreyeva T. <u>A Review and Meta-analysis of the Impact of Local U.S. Sugar-sweetened Beverage Taxes on</u> <u>Demand.</u> Research Brief No. 121.

Impact on Demand: Evidence on Consumption, Purchases and Volume Sold

FIGURE 2 Demand Meta-analysis Results by Study Measure



Source: Powell LM, Marinello S, Leider J, Andreyeva T. <u>A Review and Meta-analysis of the Impact of Local U.S. Sugar-sweetened Beverage Taxes on</u> <u>Demand.</u> Research Brief No. 121.

Impact of SSB Taxes on Demand in the U.S.: Estimates of Price Elasticity of Demand

Study	Site	Est [95% CI]
Falbe 201614	Berkeley, CA	-7.57 [-13.25; -0.16]
Silver 2017 ¹⁵	Berkeley, CA	-3.03 [-3.12; -2.93]
Silver 201715	Berkeley, CA	-6.26 [-19.13; 6.63]
Taylor 201916	Berkeley, CA	-7.63 [-13.66; 0.41]
Taylor 201916	Berkeley, CA	-3.72 [-4.92; -2.43]
Lee 2019 ¹⁷	Berkeley, CA	-13.88 [-20.44; -7.57]
Rojas 202118	Berkeley, CA	0.06 [-5.05; 6.15]
Powell 2020 ¹⁹	Cook County, IL	-0.79 [-0.88; -0.73]
Powell 2020 ²⁰	Cook County, IL	• -0.75 [-0.99; -0.48]
Cawley 2020 ²¹	Oakland, CA	-8.61 [-21.05; 3.84]
Cawley 2020 ²¹	Oakland, CA	-5.96 [-13.79; 1.87]
Cawley 2020 ²¹	Oakland, CA -	1.82 [-3.38; 7.03]
Léger 2021 ²²	Oakland, CA +	-2.05 [-2.40; -1.59]
Zhong 20189	Philadelphia, PA	-0.81 [-2.06; 0.45]
Roberto 2019 ⁸	Philadelphia, PA	-1.44 [-2.72; -0.16]
Cawley 201923	Philadelphia, PA	-2.52 [-4.94; -0.11]
Cawley 201923	Philadelphia, PA	-0.33 [-1.23; 0.57]
Cawley 201923	Philadelphia, PA	-0.47 [-1.73; 0.78]
Zhong 2020 ¹⁰	Philadelphia, PA	-0.28 [-1.80; 1.23]
Bleich 2020 ²⁴	Philadelphia, PA -	-1.64 [-2.75; -0.54]
Lawman 2020 ²⁵	Philadelphia, PA	-0.10 [-1.08; 0.88]
Cawley 2020 ²⁶	Philadelphia, PA	+ -1.13 [-1.76; -0.51]
Seiler 202127	Philadelphia, PA 🚽	-1.88 [-2.52; -1.24]
Powell 2020 ²⁸	Seattle, WA	-1.48 [-1.69; -1.28]
Saelens 2020 ²⁹	Seattle, WA	0.45 [-2.23; 3.04]
Saelens 202029	Seattle, WA	0.78 [-1.61; 3.17]
		-1.47 [-2.11; -0.83]

SSB taxes reduce demand:

- On average, estimated price elasticity of demand based on evaluations of local U.S. SSB taxes is -1.47.
 - A tax that raises SSB prices by 25%, for example, is expected to reduce demand for SSBs by 37%.
- Based on a subset of 5 studies, one quarter of the estimated reduction in demand was offset by cross-border shopping. After accounting for crossborder shopping, the average estimated price elasticity of demand was -1.1

Source: Powell LM, Marinello S, Leider J, Andreyeva T. <u>A Review and Meta-analysis of the Impact of Local U.S. Sugar-sweetened Beverage Taxes on</u> <u>Demand.</u> Research Brief No. 121.

Evidence on Substitution to Untaxed Beverages

Seattle SBT Impact on Volume Sold of Untaxed Beverages, 2-years post-tax

	Overall beverages	Individual-size beverages	Family-size beverages
Untaxed	+5%	+2%	+6%
Water	+9%	-7%	+12%
Unsweet milk	+1%	+7%	+1%
Sweetened Milk	+6%	+9%	+6%
Unsweet Juice	-2%	-1%	-2%
Juice Drink	+7%	+16%	-9%
Soda	+5%	+9%	+5%
Sports Drink	+6%	+5%	IS
Energy Drink	0%	0%	IS
Tea/Coffee	+5%	+4%	IS

Substitution to Untaxed Beverages:

- There was moderate substitution to untaxed beverages of 4-5% in Seattle.
- Mixed results across jurisdictions; e.g., no change in Cook County and mixed for Philadelphia.

Sources: Powell LM & Leider J. (2020). The impact of Seattle's sweetened beverage tax on beverage prices and volume sold. Economics and Human Biology. 37:100856 Available online: https://doi.org/10.1016/j.ehb.2020.100856

Powell, L.M. and Leider, J., (2021). Impact of a sugar-sweetened beverage tax two-year post-tax implementation in Seattle, Washington, United States. Journal of Public Health Policy, 42:574-588. Available online: <u>https://doi.org/10.1057/s41271-021-00308-8</u>

Leider J, Oddo VM, Powell LM. A Review of the Effects of U.S. Local Sugar-Sweetened Beverage Taxes on Substitution to Untaxed Beverages and Food Items. Research Brief No. 123.

Impact of Seattle SBT on Substitution to Food

SBT Impact on Substitution to Foods

	Year 1 Post-tax	Year 2 Post-Tax
Change in sales of sweets	+4%	+6%
Change in calories sold of sweets	+3%	+4%
Change in sales of snacks	0%	0%

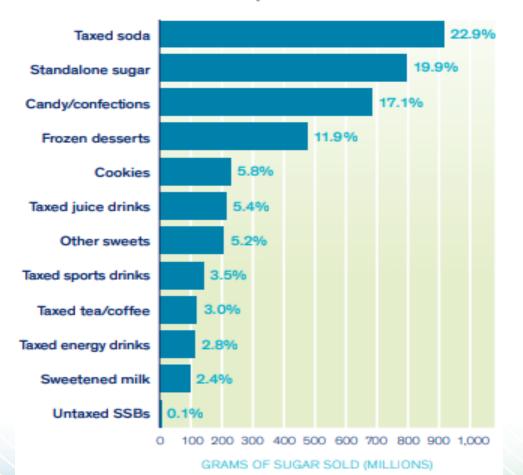
Substitution to Foods:

- Substitution to sweets but not salty snacks.
- By comparison, no substitution to sweets or salty snacks in Philadelphia

Sources: Oddo V, Leider J, Powell LM. (2021). The impact of Seattle's sugar-sweetened beverage tax on substitution to sweets and salty snacks. *Journal of Nutrition.* 151(10): 3232–3239. Available online: https://doi.org/10.1093/jn/nxab194 Leider J, Oddo VM, Powell LM. *A Review of the Effects of U.S. Local Sugar-Sweetened Beverage Taxes on Substitution to Untaxed Beverages and Food Items.* Research Brief No. 123.

Distribution of Sugar Sold in Seattle

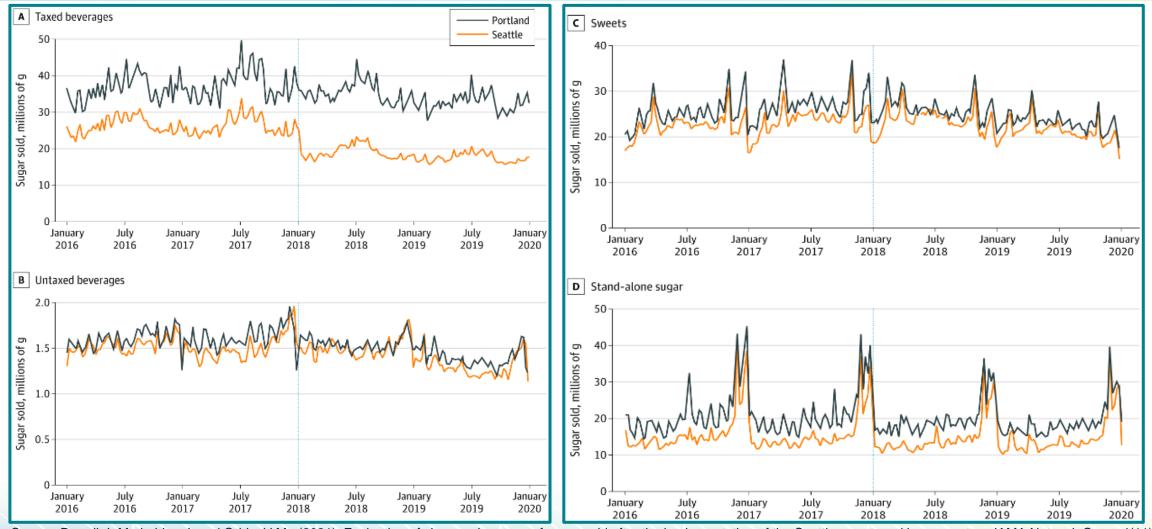
FIGURE 3 Sources of Sugar in Seattle, Washington, One-Year Pre-Tax Implementation¹⁴



Source: Powell, L.M., Leider, J. and Oddo, V.M., (2021). Evaluation of changes in grams of sugar sold after the implementation of the Seattle sweetened beverage tax. JAMA Network Open, 4(11), pp. e2132271-e2132271. Available online: https://doi.org/10.1001/jamanetworkopen.2021.32271

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

Evidence of Seattle SBT on Changes in Grams of Sugar Sold



Source: Powell, L.M., Leider, J. and Oddo, V.M., (2021). Evaluation of changes in grams of sugar sold after the implementation of the Seattle sweetened beverage tax. JAMA Network Open, 4(11), p. e2132271-e2132271. Available online: https://doi.org/10.1001/jamanetworkopen.2021.32271

Evidence on Impact of Changes in Sugar Sold from SSBs

Seattle SBT Impacts				
	Year 1 Post-tax	Year 2 Post-Tax		
Change in grams of sugar sold from taxed SSBs	-23%	-23%		
Change in grams of sugar sold from untaxed beverages	+4%	0%		
Change in grams of sugar sold from sweets	+4%	+4%		
Change in grams of sugar sold from stand alone sugar	0%	4%		
Net change in grams of sugar sold from SSBs accounting for substitution	-18%	-19%		

Impact on Sugar sold from SSBs:

 19% net reduction 2-years post-tax in sugar sold from taxed SSBs after accounting for substitution to sweets as well as standalone sugar and untaxed beverages.

Source: Powell, L.M., Leider, J. and Oddo, V.M., (2021). Evaluation of changes in grams of sugar sold after the implementation of the Seattle sweetened beverage tax. JAMA Network Open, 4(11), pp. e2132271-e2132271. Available online: https://doi.org/10.1001/jamanetworkopen.2021.32271

Evidence on Substitution to Alcohol

Seattle SBT Impact on Volume Sold of Alcohol

	Year 1 Post-tax	Year 2 Post-Tax
Beer	+5%	+7%
Wine	0%	-3%
Alcohol	+4%	+5%

Substitution to Alcohol:

- In Seattle, volume sold of beer increased by 7% at 2-years posttax implementation while volume sold of wine decreased by 3%, with overall alcohol volume sold increasing by 5%.
- By comparison, for example, in Philadelphia, no change was found in volume sold of wine or spirits up to 1-year post-tax; beer was not evaluated.

Source: Powell LM. & Leider J. (2022). Impact of the Seattle sweetened beverage tax on substitution to alcoholic beverages. *Plos One,* 17(1): e0262578. Available online: https://doi.org/10.1371/journal.pone.0262578. Available online:

Summary of Seattle SBT Impacts

Seattle SBT Impacts				
	Year 1 Post-tax	Year 2 Post-Tax		
Change in prices (¢/oz)	1.03	1.04		
Tax pass-through rate	59%	59%		
Change in volume sold of taxed beverages	-22%	-22%		
Change in volume sold of untaxed beverages	+4%	+5%		
Change in sales of sweets	+4%	+6%		
Change in calories sold of sweets	+3%	+4%		
Change in sales of snacks	0%	0%		
Change in grams of sugar sold from SSBs (gross, net)	-23%, -18%	-23%, -19%		
Change in volume sold of beer	+5%	+7%		
Change in volume sold of wine	0%	-3%		

Overview of UIC Study Findings on SSB Tax Impacts for Seattle

UC Policy, Practice and Prevention Research Center P3RC RESEARCH BRIEF NO. 124 NOVEMBER 2021

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

LISA M. POWELL¹² AND JULIEN LEIDER²

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 crossborder 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-vears post-tax.

AUTHOR AFFILIATIONS

 Health Policy and Administration, School of Public Health, University of Illinois Chicago, Chicago, IL.
 Institute for Health Research and Policy, University of Illinois Chicago, Chicago, IL. Sugar-sweetened beverage (SSB) consumption is associated with chronic health problems¹⁻³ and is the leading source of added sugars intake in the U.S.⁴⁴ Anong 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.⁶ Further, in 2018, 19.8% of Seattle adults were obese and 7.1% had diabetes,⁷ both conditions associated with SSB consumption.¹³ Children are also affected: among 8th, 10th, and 12th grade Seattle children in 2018, 11.4% consumed SSBs daily, and 10.7% were obese.⁷

SSB taxes have been recognized by both national and international organizations as a potential means to reduce SSB consumption and associated health conditions.⁵⁶ SSB taxes (which may also apply to artificially sweetened beverages) are currently implemented in more than 40 countries and 7 U.S. cities.¹⁰ 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 analyse the impact of the 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 twoyears post-tax, based on difference-in-differences analyses with Portland, Oregon, as a comparison site.¹¹⁴⁴

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-" and two-year" post-tax impacts of the SBT on tax pass-through, volume sold of taxed and untaxed beverages and cross-border shopping and a study-¹⁰ that examined substitution to sweets and satty 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." And, we summarize study¹⁴ 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 ibself, 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. Powell LM, Leider J. <u>An Overview of the Impact of the</u> <u>Seattle, Washington, Sweetened Beverage Tax on</u> <u>Prices, Demand, Substitution, and Sugar Sold.</u> Research Brief No. 124.

Available from: <u>https://p3rc.uic.edu/resources/p3rc-publications-by-type/</u>

Further Information on SSB Tax Impacts Across the U.S.

- Chriqui JF, Pipito AA, Asada Y, Powell LM. <u>Lessons learned from the adoption</u> and implementation of sweetened beverage taxes in the United States: A <u>narrative review</u>. Research Brief No. 119.
- Powell LM, Marinello S, Leider J. <u>A Review and Meta-analysis of Tax Pass-through of Local Sugar-Sweetened Beverage Taxes in the United</u> <u>States.</u> Research Brief No. 120.
- Powell LM, Marinello S, Leider J, Andreyeva T. <u>A Review and Meta-analysis of</u> <u>the Impact of Local U.S. Sugar-sweetened Beverage Taxes on</u> <u>Demand.</u> Research Brief No. 121.
- 4. Marinello S, Powell LM. <u>A Review of the Labor Market Impacts of Local Sugar-</u> <u>Sweetened Beverage Taxes in the United States.</u> Research Brief No. 122.
- Leider J, Oddo VM, Powell LM. <u>A Review of the Effects of U.S. Local Sugar-Sweetened Beverage Taxes on Substitution to Untaxed Beverages and Food Items.</u> Research Brief No. 123.

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