

Associations between the Sweetened Beverage Tax Implementation in Seattle, WA and
Changes in Supermarket Interior Marketing Displays

Nicole Asa

A thesis

submitted in partial fulfillment of the
requirements for the degree of

Masters of Public Health

University of Washington

2022

Committee:

Jessica Jones-Smith

Melissa Knox

Lina Pinero-Walkinshaw

Program Authorized to Offer Degree:

Department of Epidemiology

©Copyright 2022
Nicole Asa

University of Washington

Abstract

Associations between the Sweetened Beverage Tax Implementation in Seattle, WA and
Changes in Supermarket Interior Marketing Displays

Nicole Asa

Chair of the Supervisory Committee:

Jessica Jones-Smith

Department of Health Systems and Population Health, Epidemiology

Sugar-sweetened beverages (SSBs) are a significant contributor to added sugar intake, leading to implementation of sugar beverage taxes. SSB taxes may impact supermarket in-store marketing strategies, leaning either towards or away from taxed beverages. Our study aims to evaluate the changes in supermarket interior marketing displays one year after the implementation of Seattle's Sweetened Beverage Tax, which went into effect January 1, 2018. This study used a quasi-experimental design with supermarkets in Seattle exposed to the tax, while supermarkets in a comparison area were unexposed. The outcome evaluated was number of SSB and non-SSB interior marketing displays at supermarkets before and after-tax implementation. We used Poisson regression difference-in-difference (DID) models to estimate the degree to which the interior marketing displays in Seattle change above and beyond the interior marketing displays in the comparison area. We found a decrease in average change of interior marketing displays for soda (DID= 0.80, 95%CI= 0.66, 0.98) and diet soda (DID= 0.74, 95%CI= 0.60, 0.91), and an increase for diet energy drinks (DID= 1.93, 95%CI: 1.11, 3.36). This evaluation found no significant changes in collective SSB and non-SSB interior marketing displays. There was little evidence supermarkets increased or decreased the number of interior marketing displays in response to the SSB tax.

Introduction

Sugar-sweetened beverages (SSBs) are a significant contributor to added sugar intake, leading to adverse health outcomes such as type 2 diabetes, obesity, and cardiovascular disease.¹⁻³ Over the past two decades, there has been global attention and increased emphasis on decreasing added sugar intake, leading to policies and interventions aimed at reducing SSB consumption.⁴ A key question is whether actions taken to decrease SSB consumption benefit public health, and through which mechanisms.¹ A 2021 study found that among U.S. children, intake of added sugar has been declining, yet consumption of SSBs remained the top source of added sugars across the time span of 2001-2018.⁴ Despite the decline of added sugar consumption, U.S. children still remain above the Dietary Guidelines for Americans recommendation of <10% energy per day, and continued monitoring of added sugar intake and sources is warranted.⁴

SSB taxes are hypothesized to affect consumption by raising prices, thus promoting a decreased demand for SSBs. As of 2021, taxes on SSBs are implemented in eight U.S. cities and more than 50 countries.^{5,6} Many studies evaluating SSB tax impacts focus on changes in SSB prices, which is a primary mechanism by which taxes affect purchasing and consumption. An alternative mechanism which could impact SSB purchasing may be store marketing practices. It is important to assess the marketing strategies of stores selling SSBs after a SSB tax implementation, as marketing influences purchasing.⁷ Research has linked price promotions and marketing at stores, such as end-aisle displays and other placement strategies, to increased purchasing, particularly of unhealthy foods and beverages.⁷ Identifying how store's marketing of SSB shifts after the implementation of a SSB tax is important to develop a more complete understanding of the effects of this type of tax.

When a city implements a sugar beverage tax, there is the potential that stores will either increase marketing, to strengthen consumer demand for SSBs, or decrease marketing, as means to protect revenue losses from decreased demand.⁸ It is also possible that stores may

shift their marketing dollars towards products that are untaxed, such as non-SSBs. When assessing distributor and store marketing responses to SSB taxes, distributors and companies lean towards aiming to reduce sugar content and avoid paying the tax; however, some distributors are wary of replacing sugar with artificial sweeteners because of consumer's fears about their health effects.⁹ An evaluation of the SSB tax in Oakland, California found reductions in SSB marketing 6 months post- tax.⁸ Yet, these findings did not persist in the longer term, as two-years after the SSB tax implementation in Oakland, California, there were no significant changes found in SSB marketing.¹⁰

Seattle's Sweetened Beverage Tax went into effect on January 1, 2018 and affects only SSBs (as opposed to also targeting artificially sweetened beverages). Seattle implemented an excise tax, which is levied on distributors, and is one of the largest taxes among U.S. cities at 1.75 cents per ounce.¹¹ A 2020 study evaluating Seattle's Sweetened Beverage Tax found that the 1.75 cents per ounce tax on distributors is being largely passed through to the consumer by 90% of the price of the tax.¹¹

Existing studies have found that these taxes effectively raise prices and decrease purchasing of taxed beverages.¹¹⁻¹⁴ It is also possible that sugar sweetened beverage taxes may impact supermarket in-store marketing strategies, leaning either towards or away from taxed beverages. Our study aims to evaluate the changes in marketing after the implementation of Seattle's Sweetened Beverage Tax. We hypothesize that the introduction of a tax is associated with a potential increase in in-store marketing of non-SSBs. We test between competing hypotheses that supermarkets increase or decrease their in-store marketing of SSBs. Specifically, our study aims to:

- 1) Determine the association between the introduction of Seattle's Sweetened Beverage Tax and changes in marketing of sugar-sweetened beverages and non-sugar sweetened beverages inside supermarkets by comparing marketing in Seattle to that of a comparison area from before to after Seattle's Sweetened Beverage tax.

2) Identify which sugar sweetened beverages and non-sugar sweetened beverages had the greatest change in supermarket interior marketing displays in Seattle and comparison areas after Seattle's Sweetened Beverage Tax implementation.

Methods

Study Design

This study used a quasi-experimental design which evaluated Seattle's Sweetened Beverage Tax. The exposure evaluated was Seattle's Sweetened Beverage Tax, which was implemented on January 1, 2018, and is imposed on distributors selling SSBs beverages inside the City of Seattle. The supermarkets in Seattle were exposed to the tax, while supermarkets in a Comparison area were unexposed. This binary exposure was coded as 1 for exposed and 0 for not exposed.

The outcome evaluated was number of SSB and non-SSB interior marketing displays at the supermarkets before and after-tax implementation. Interior marketing displays were defined as end aisle displays and special floor displays. An end aisle display refers to advertising of products at the end of shelf rows (Appendix 1a), and special floor displays are advertising of products as a stand-alone unit (Appendix 1b). Data on interior marketing displays were collected for the following beverages: soda, energy drinks, sports drinks, juice, and bottled water. If an interior marketing display included multiple beverages, it was counted once for each beverage promoted. To assess the change in interior marketing displays for Aim 1, we created two composite scores, one for SSB displays, and another for non-SSB displays. For SSBs, the composite score variable was created by summing up the total number of end aisle displays and special floor displays present for each SSB drink category, for a maximum score of 8. The composite score for non-SSBs was created similarly, but also included bottled water for a maximum score of 10. For example, if a store had an end aisle display and a special floor display present for soda, and an end aisle display present for a taxed sports drink, then that

store would have a SSB composite score of 3. For Aim 2, we examined each individual SSB or non-SSB type (i.e., soda, sports drink, etc.) separately.

Covariates included store fixed effects and the week of data collection as precision variables. Store fixed effects were included in the model as an indicator variable to compare each store to itself over time. We also adjusted for the week when data collection took place, as the data were collected in the weeks before and after Thanksgiving. We hypothesized that there would be an increase in interior marketing displays leading up to the holiday, and then a reduction after. The stores with data collected 3, 4, and 5 weeks prior to Thanksgiving were included as dummy coded as 1, stores with data collected 1 and 2 weeks prior to Thanksgiving were coded as 2, and stores with data collected the week of Thanksgiving and one week after Thanksgiving were coded as 3. The week of data collection was included in the model as a dummy variable.

Study Setting

This study was designed to assess the local beverage marketing environment before and after the introduction of a beverage tax in the city of Seattle, Washington. The comparison area is a group of three smaller cities that are 8–20 miles south of Seattle, including Kent, Auburn and Federal Way, Washington. These cities were chosen as the comparison area for several reasons: 1) this area is subject to the same state and regional policies (these three cities are in the same county as Seattle), 2) this area has a similar economic climate, and 3) to avoid places that might introduce a beverage tax during the study period (e.g., larger nearby cities such as Tacoma, WA and Portland, OR were actively considering beverage taxes when baseline data collection began).

Study Subjects

Information about interior marketing displays was collected for supermarkets in Seattle and the comparison area as part of an evaluation of the impact of Seattle's Sweetened Beverage Tax. We limited the analytic sample to large supermarkets as they were more

comparable to one another than the smaller stores, and there were few small stores that had any interior displays. Large stores were defined as superstores, supermarkets, or grocery stores. To be considered a superstore, a store must carry a wide array of products including clothing, household items, etc. To be qualified as a supermarket, the store must sell fresh meat, have four or more cash registers (including self-checkout), and have at least two of the following: butcher, bakery, and/or deli. A grocery store must sell fresh meat, and not meet all the criteria for being a supermarket. In our sample, there were 47 (23.5%) superstores, 66 (33.0%) supermarkets, and 87 (43.5%) grocery stores, for a total sample size of 200 stores (Figure 1).

Data Collection

Data on interior marketing displays were collected through the above-mentioned study which aimed to assess how key features of the local food environment (availability, pricing, and promotion of food and beverage products) might change in response to Seattle's Sweetened Beverage Tax. Data collection first took place between October and mid-November 2017, before the SSB tax was implemented. Data was collected again 12 months after the tax implementation, starting October through mid-November 2018.

Data Analysis

We used Poisson regression models and a difference-in-difference (DID) design to estimate the degree to which the interior marketing displays of SSBs and non-SSBs in Seattle changes above and beyond the interior marketing displays over the same period for the same beverages in the comparison area. The analysis for Aim 1 used the SSB composite score and non-SSB composite score in two separate models to determine the change in overall interior marketing displays. Aim 2 was analyzed through separate models fitted for each individual SSB and non-SSB type to determine whether any specific drink category had the greatest change over time. The covariates are consistent throughout both aims and all models. We determined statistical significance at $\alpha = 0.10$ and report corresponding 90% confidence intervals due to the small sample size and difference-in-difference design with store fixed effects.

In three separate sensitivity analyses, we examined whether results are substantially different when 1) removing special floor displays and using only end aisle displays, as there may be a disproportionate number of special floor displays as data collection took place during the holiday season; 2) replacing store fixed effects with store type (i.e., grocery store, supermarket, superstore) to allow for better power at the expense of less control for store-level confounders; and 3) excluding bottled water from the non-SSB composite score as bottled water is different from other non-SSBs and may be marketed differently.

Results

Store Characteristics

In our sample, there were 47 (23.5%) superstores, 66 (33.0%) supermarkets, and 87 (43.5%) grocery stores, for a total sample size of 200 stores (Figure 1). The range of re-survey rates for the store types comparing baseline and post-tax stores was 83.3% to 91.7% (total re-survey rate= 82.9%) for Seattle stores, and 84.6% to 100.0% (total re-survey rate= 89.5%) for comparison area stores (Figure 1).

Interior Marketing Display Characteristics: unadjusted means and changes over time for Seattle and comparison area

For all drink types, except for soda and diet soda, the mean was higher in interior marketing displays one-year after the SBT implementation in Seattle. In the comparison area stores, the mean was higher in interior marketing displays for all drink types (Table 1). Similarly, the number of end aisle displays and special floor displays was higher in both Seattle and the comparison area (Table 1). The majority of interior marketing displays for both timepoints in Seattle and comparison area consisted of soda and diet soda displays. In Seattle, the average composite score for SSBs was 1.6 (SD=1.5) for baseline, and 2.4 (SD=2.1) one-year post-tax. In the comparison area, the average composite score for SSBs was 2.7 (SD=1.6) for baseline and 5.0 (SD=1.7) one-year post-tax. Similarly, the average composite score for non-SSBs was 1.7 (SD=1.6) for Seattle baseline, 3.0 (SD=2.4) for Seattle one-year post-tax, 2.9 (SD=2.0) for

comparison area baseline, and 5.6 (SD=2.5) for comparison area one-year post-tax. Thus, the mean composite score for non-SSBs compared to SSBs was higher for all timepoints in both Seattle and comparison area.

Aim 1: Quantifying change in interior marketing displays using a composite score

Table 2 shows the change in composite score for SSB and non-SSBs by store type. In Seattle, changes of the SSB composite score are positive for all three store types, with a change of 1.1 in superstores, a change of 1.0 in supermarkets, and a change of 0.4 in grocery stores (Table 2). Similarly, in the comparison area, the changes of the SSB composite were 2.2 for superstores, 2.6 for supermarkets, and 2 for grocery stores. The unadjusted means of SSBs and non-SSBs from baseline to one-year post-tax was higher in the comparison area than Seattle for all store types (Table 2).

Table 3 presents the adjusted difference-in-difference estimates for one-year changes in interior marketing displays, adjusting for store fixed effects and week of data collection. The average relative change in SSB interior market displays was 0.85 times lower than the change in the comparison area but this change was not statistically significant (90%CI= 0.71, 1.01). Similarly, the average relative change in non-SSB interior marketing displays was 0.89 times lower than the change in the comparison area, and was also not statistically significant (90%CI= 0.73, 1.07) (Table 3).

Aim 2: Quantifying change in interior marketing displays of individual beverages

All beverage types had a small increase change in the unadjusted means comparing pre- and post- tax interior marketing displays in both Seattle and comparison area, except for soda (Table 2). Taxed soda had a change of 0.0 in Seattle comparing pre-tax to post-tax, and a change of 0.3 in the comparison area comparing pre-tax to post-tax (Table 2).

When looking at the adjusted difference-in-difference estimates of SSB and non-SSB types, there was an average relative change of interior marketing displays which was 0.80 times lower for soda displays (90%CI= 0.66, 0.98) and 0.74 times lower for diet soda displays

(90%CI= 0.60, 0.91) than the change in the comparison area, both at the significant level (Table 3). Diet energy drink interior marketing displays were the only beverage that significantly increased one-year post sweetened beverage tax in Seattle relative to the comparison area, with the average relative change 1.93 times higher than the change in the comparison area (90%CI: 1.11, 3.36). But, this association should be interpreted with caution as the 90% confidence interval is very wide. There were no other beverage types with significant changes between Seattle and the comparison area (Table 3).

Sensitivity Analyses

We conducted three sensitivity analyses: 1) excluding special floor displays and including only end aisle displays, 2) adjusting for store type (i.e., grocery store, supermarket, superstore) in replace of store fixed effects, and 3) excluding bottled water from the non-SSB composite score. For sensitivity analysis 1, using only end aisle displays, the difference-in-difference estimates for SSB and non-SSB composite scores, soda, diet soda, diet energy drink, sports drink, and water were statistically significant, indicating lower probability of end aisle displays in Seattle compared to the comparison area in association with the tax (Table 4a, Table 4b). With using only end-aisle displays, they may behave more uniformly and thus be more consistent throughout the findings. There were no differences in the estimates when comparing the standard model to sensitivity analysis 2, adjusting for store type, and sensitivity analysis 3, excluding bottled water. These sensitivity analyses indicated that the models are sensitive to whether we include end aisle and special floor displays or just end aisle displays, but do not change with the omission of fixed effects or bottled water.

Discussion

This study provides new evidence on one-year changes in in-store supermarket advertising through interior marketing displays following the 2018 Seattle Sweetened Beverage Tax implementation. Identifying how the tax affects beverage advertising is important to develop a complete understanding of the mechanisms by which the SSB tax plays a role in reducing

consumption of SSBs. This evaluation found no significant changes in collective SSB and non-SSB interior marketing displays, through the composite score. Thus, there was little evidence that distributors, such as supermarkets, increased or decreased the number of interior marketing displays in response to the SSB tax. While there was an increase in the total number of interior marketing displays in Seattle 12-months after tax implementation, it did not differ significantly from the comparison area. A similar study in Oakland, California, addressed price promotions, exterior displays, and interior displays 6-months, 12-months, and two years after the implementation of their SSB tax. Zenk et al. found that interior marketing was fairly consistent after the Oakland tax implementation for both SSBs and non-SSBs⁸, and these findings persisted long term at the 2-year follow-up.¹⁰ The two year evaluation in Oakland found no differences in the interior advertising of SSBs and non-SSBs.¹⁰ Comparing these results to our study, they are consistent in the direction and significance of the one-year and two-year post-tax findings. One possible explanation for the null results from our study is that distributors have similar marketing strategies for Seattle stores and the comparison area outside Seattle. While we are not able to differentiate between interior marketing display decisions by retailers or the store itself, those decided by the retailer are likely to be similar across all stores in the same county.

Our results also indicated that there was a decrease in soda and diet soda interior marketing displays, and an increase in diet energy drink displays comparing Seattle to the Comparison area, over the study period. There was no significant change for any other beverage. This suggests that distributors or retailers may have adjusted their marketing strategies after the SSB tax implementation by reducing advertising for SSBs, such as soda, potentially to offset revenue losses associated with the tax. There is the potential that the pass through of the SSB tax on energy drinks was high, and thus energy drink companies decided to market their diet versions more aggressively in order to reduce loss of business, leading to the increase in diet energy drink interior marketing displays in our sample. Alternatively, energy drink companies may have

increased interior marketing displays of diet energy drinks to shift customer views of diet energy drinks as a substitute for SSBs. Food and beverage advertisements, such as interior marketing displays of SSBs and non-SSBs, can have substantial effect on food purchasing and consumption.¹⁵ Focusing on decreasing interior marketing displays of SSBs can help to boost the effect of the sweetened beverage taxes and reduce the purchasing and consumption of SSBs.^{16–18}

Our results of no differences in overall SSB and non-SSB interior marketing differs from the promotion following tobacco taxes. Following the implementation of tobacco taxes, the tobacco industry developed multiple promotional strategies, including multi-pack discounts and couponing, which ultimately increased promotions to reduce the effectiveness of the tobacco tax increase.^{19,20} In 2018, tobacco products remained one of the most heavily marketed consumer products in the United States²¹, suggesting that the association between implementation of a tax and marketing differ for the tobacco industry and the SSB industry.

There are several limitations that may impact the results of the study. First, baseline and 12-month follow-up data collection took place directly before and after Thanksgiving, which may not have given an accurate representation of interior marketing displays outside of the holiday season. While we adjust for this variable by including the timing of data collection in relation to the week of Thanksgiving and we collected data at the same time in the comparison group, there may be residual confounding and associations might be different for different months of the year. Second, there is the potential that cross border shopping may have impacted the number of marketing displays. We used a comparison area close to Seattle, so it is possible that people from Seattle may be purchasing SSBs from comparison area supermarkets as opposed to Seattle supermarkets. Thus, the number of interior marketing displays may be due to the increase of cross boarder shopping. For example, perhaps stores or marketers in the comparison area anticipated cross boarder shopping and increased advertising to promote sales of these goods. However, the likelihood of this is lower by the fact that the comparison

area stores are 8-20 miles away from Seattle, rather than just outside the border. Third, our data are limited in that we cannot differentiate between marketing displays of retailers, distributors, and manufacturers; consequently, we are not able to measure the impact each has on the number and type of marketing displays. Nevertheless, all parties share the same interest in maximizing profit. Fourth, we are not able to test the parallel trend assumption because we only have one data point before tax implementation, and one data point after tax implementation. We see baseline differences in levels, supporting our decision to use Poisson regression so we are able to evaluate the proportional change.

Conclusion

This study provides novel insights on how Seattle's Sweetened Beverage Tax impacts SSB and non-SSB advertising through interior marketing displays. We found no significant changes in overall SSB and non-SSB interior marketing displays. There was a reduction in soda and diet soda displays, and an increase in diet energy drink displays comparing Seattle to the Comparison areas.

References

1. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. *Am J Public Health*. 2007;97(4):667-675. doi:10.2105/AJPH.2005.083782
2. Malik VS, Popkin BM, Bray GA, Després JP, Hu FB. Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. *Circulation*. 2010;121(11):1356-1364. doi:10.1161/CIRCULATIONAHA.109.876185
3. Johnson RK, Appel LJ, Brands M, et al. Dietary sugars intake and cardiovascular health: a scientific statement from the American Heart Association. *Circulation*. 2009;120(11):1011-1020. doi:10.1161/CIRCULATIONAHA.109.192627
4. Ricciuto L, Fulgoni VL, Gaine PC, Scott MO, DiFrancesco L. Trends in added Sugars Intake and Sources Among U.S. Children, Adolescents and Teens using NHANES 2001-2018. *J Nutr*. 2021;131(2):604S--615S. doi:10.1093/jn/nxab395
5. Leider J, Powell LM. Longer-term impacts of the Oakland, California, sugar-sweetened beverage tax on prices and volume sold at two-years post-tax. *Soc Sci Med*. Published online November 2021:114537. doi:10.1016/j.socscimed.2021.114537
6. Global Food Research Program. Sugary drink taxes around the world. Published online 2022.
7. Bennett R, Zorbas C, Huse O, et al. Prevalence of healthy and unhealthy food and beverage price promotions and their potential influence on shopper purchasing behaviour: A systematic review of the literature. *Obes Rev*. 2020;21(1):e12948. doi:10.1111/obr.12948
8. Zenk SN, Leider J, Pugach O, Pipito AA, Powell LM. Changes in Beverage Marketing at Stores Following the Oakland Sugar-Sweetened Beverage Tax. *Am J Prev Med*. 2020;58(5):648-656. doi:10.1016/J.AMEPRE.2019.12.014
9. Forde H, Penney TL, White M, Levy L, Greaves F, Adams J. Understanding Marketing Responses to a Tax on Sugary Drinks: A Qualitative Interview Study in the United Kingdom, 2019. *Int J Heal Policy Manag*. 2022;2022:1-12. doi:10.34172/ijhpm.2022.5465
10. Zenk SN, Li Y, Leider J, Pipito AA, Powell LM. No long-term store marketing changes following sugar-sweetened beverage tax implementation: Oakland, California. *Heal Place*. 2021;68. doi:10.1016/j.healthplace.2021.102512
11. Jones-Smith JC, Pinero Walkinshaw L, Oddo VM, et al. Impact of a sweetened beverage tax on beverage prices in Seattle, WA. *Econ Hum Biol*. 2020;39:100917. doi:10.1016/j.ehb.2020.100917
12. Roberto CA, Lawman HG, Levasseur MT, et al. Association of a Beverage Tax on Sugar-Sweetened and Artificially Sweetened Beverages With Changes in Beverage Prices and Sales at Chain Retailers in a Large Urban Setting. *JAMA*. 2019;321(18):1799. doi:10.1001/JAMA.2019.4249
13. Powell LM, Leider J, Oddo VM. Evaluation of Changes in Grams of Sugar Sold After the Implementation of the Seattle Sweetened Beverage Tax. *JAMA Netw open*. 2021;4(11):e2132271. doi:10.1001/JAMANETWORKOPEN.2021.32271
14. Powell LM, Leider J. Impact of a sugar-sweetened beverage tax two-year post-tax implementation in Seattle, Washington, United States. *J Public Health Policy*. Published online November 3, 2021. doi:10.1057/S41271-021-00308-8
15. Vukmirovic M. The effects of food advertising on food-related behaviours and perceptions in adults: A review. *Food Res Int*. 2015;75:13-19. doi:10.1016/J.FOODRES.2015.05.011
16. Escaron AL, Meinen AM, Nitzke SA, Martinez-Donate AP. Supermarket and Grocery Store-Based Interventions to Promote Healthful Food Choices and Eating Practices: A Systematic Review. *Prev Chronic Dis*. 2013;10(4):1-20. doi:10.5888/PCD10.120156

17. Bennett R, Zorbas C, Huse O, et al. Prevalence of healthy and unhealthy food and beverage price promotions and their potential influence on shopper purchasing behaviour: A systematic review of the literature. Published online 2019. doi:10.1111/obr.12948
18. Watt TLS, Beckert W, Smith RD, Cornelsen L. Reducing consumption of unhealthy foods and beverages through banning price promotions: what is the evidence and will it work? *Public Health Nutr.* 2020;23(12):2228-2233. doi:10.1017/S1368980019004956
19. Apollonio DE, Glantz SA, Author C. Tobacco Industry Promotions and Pricing After Tax Increases: An Analysis of Internal Industry Documents. *Nicotine Tob Res.* 2020:967-974. doi:10.1093/ntr/ntz068
20. Chaloupka FJ, Cummings KM, Morley CP, Horan JK. Tax, price and cigarette smoking: evidence from the tobacco documents and implications for tobacco company marketing strategies. *Tob Control.* 2002;11(suppl 1):i62-i72. doi:10.1136/TC.11.SUPPL_1.I62
21. American Lung Association. Tobacco Industry Marketing . Published 2018. Accessed June 6, 2022. <https://www.lung.org/policy-advocacy/tobacco/tobacco-industry-marketing>

Tables and Figures

Figure 1: Flowchart of the Breakdown of Data Collection by Store Type at Baseline and Post-Tax

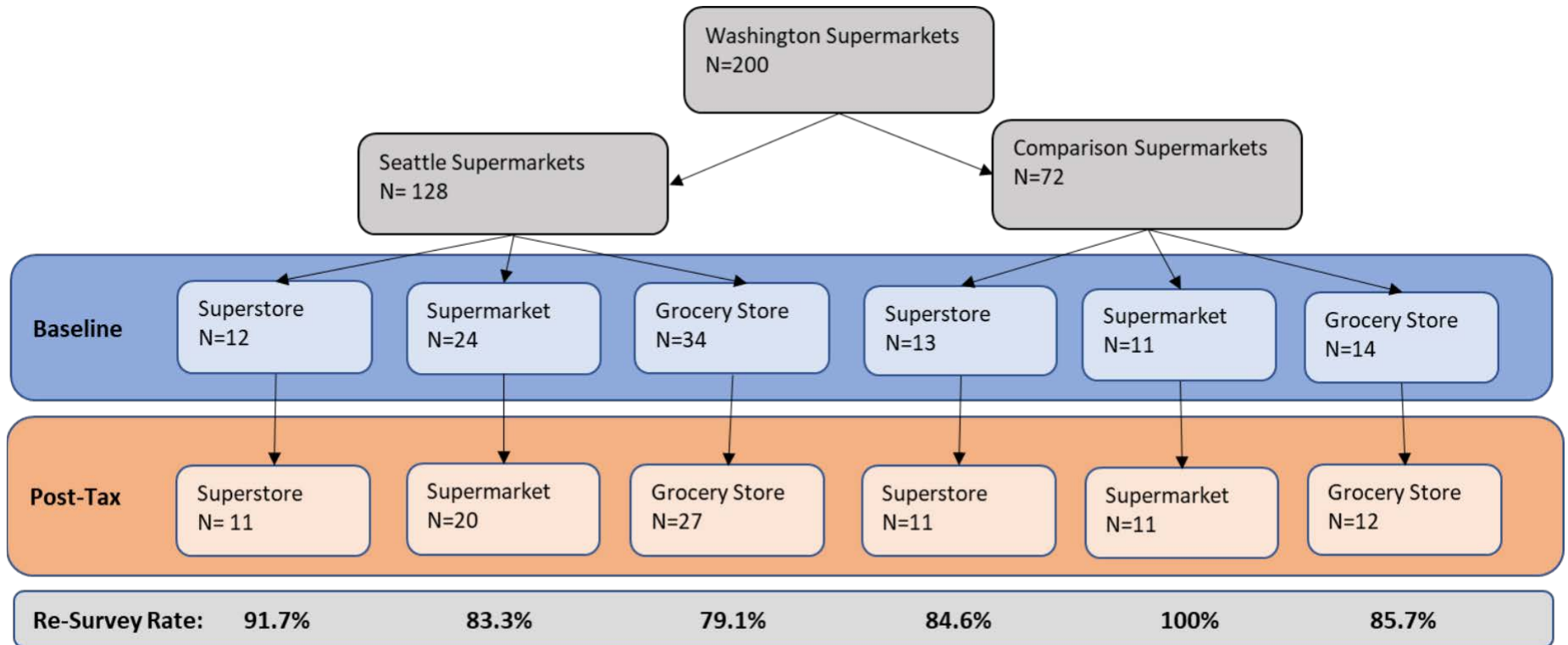


Table 1. Characteristics of Interior Marketing Displays for Seattle and Comparison Area, at Baseline and Post-Tax

	Seattle				Comparison			
	Baseline (N=234) ¹		Post-Tax (N=309) ¹		Baseline (N=213) ¹		Post-Tax (N=359) ¹	
	n	(%)	n	(%)	n	(%)	n	(%)
<i>Sugar Sweetened Beverages</i>								
Soda	56	(23.9)	45	(14.6)	51	(23.9)	55	(15.3)
Energy Drinks	13	(5.6)	37	(12.0)	17	(8.0)	39	(10.9)
Sports Drinks	15	(6.4)	21	(6.8)	13	(6.1)	33	(9.2)
Juice Drinks	29	(12.4)	34	(11.0)	23	(10.8)	42	(11.7)
<i>Non-Sugar Sweetened Beverages</i>								
Diet Soda	51	(21.8)	40	(12.9)	44	(20.7)	51	(14.2)
Diet Energy Drinks	8	(3.4)	34	(11.0)	17	(8.0)	35	(9.7)
Diet Sports Drinks	4	(1.7)	14	(4.5)	10	(4.7)	24	(6.7)
100% Juice Drinks	22	(9.4)	33	(10.7)	13	(6.1)	31	(8.6)
Water	36	(15.4)	51	(16.5)	25	(11.7)	49	(13.6)
<i>Types of Interior Displays</i>								
End Aisle Displays	195	(83.3)	233	(75.4)	134	(62.9)	236	(65.7)
Special Floor Displays	39	(16.7)	76	(24.6)	79	(37.1)	123	(34.3)
<i>Composite Beverage Scores, Mean (SD)</i>								
SSB composite score	1.6	(1.5)	2.4	(2.1)	2.7	(1.6)	5.0	(1.7)
Non-SSB composite score	1.7	(1.6)	3.0	(2.4)	2.9	(2.0)	5.6	(2.5)

¹ N= the total number of interior marketing displays captured at the timepoint

Table 2: Unadjusted Means and Changes of Interior Marketing Displays Comparing Seattle and Comparison Areas at Baseline and 12-months post Sweetened Beverage Tax

	Seattle			Comparison		
	Baseline	Post-Tax	Change	Baseline	Post-Tax	Change
	Mean (90%CI)	Mean (90%CI)		Mean (90%CI)	Mean (90%CI)	
<i>Sugar Sweetened Beverage Composite Score</i>						
Superstore	1.8 (1.1,2.5)	2.9 (1.9,3.9)	1.1	2.3 (1.5,3.1)	4.5 (3.7,5.2)	2.2
Supermarket	2.3 (1.8,2.8)	3.3 (2.5,4.1)	1.0	2.8 (2.1,3.5)	5.4 (4.5,6.3)	2.6
Grocery Store	1.0 (0.7,1.4)	1.4 (0.9,2.0)	0.4	3.1 (2.2,3.9)	5.1 (4.0,6.1)	2.0
<i>Non-Sugar Sweetened Beverage Composite Score</i>						
Superstore	2.3 (1.4,3.2)	3.5 (2.4,4.7)	1.2	2.5 (1.5,3.5)	4.5 (3.8,5.1)	2.0
Supermarket	2.5 (2.0,3.0)	3.9 (2.8,4.9)	1.4	2.9 (1.9,3.9)	6.5 (5.2,7.9)	3.6
Grocery Store	0.9 (0.6,1.3)	2.1 (1.4,2.8)	1.2	3.2 (2.2,4.2)	5.8 (4.2,7.3)	2.6
<i>Sugar Sweetened Beverages</i>						
Soda	0.8 (0.7,0.9)	0.8 (0.6,0.9)	0.0	1.3 (1.2,1.5)	1.6 (1.5,1.8)	0.3
Energy Drinks	0.2 (0.1,0.3)	0.6 (0.5,0.8)	0.4	0.4 (0.3,0.6)	1.1 (0.9,1.4)	0.7
Sports Drinks	0.2 (0.1,0.3)	0.4 (0.2,0.5)	0.2	0.3 (0.2,0.5)	1.0 (0.8,1.2)	0.7
Juice Drinks	0.4 (0.3,0.5)	0.6 (0.4,0.7)	0.2	0.6 (0.5,0.8)	1.2 (1.1,1.4)	0.6
<i>Non-Sugar Sweetened Beverages</i>						
Soda	0.7 (0.6,0.9)	0.7 (0.5,0.9)	0.0	1.2 (1.0,1.4)	1.5 (1.3,1.7)	0.3
Energy Drinks	0.1 (0.1,0.2)	0.6 (0.4,0.7)	0.5	0.4 (0.3,0.6)	1.0 (0.8,1.2)	0.6
Sports Drinks	0.1 (0.0,0.1)	0.2 (0.1,0.3)	0.1	0.3 (0.1,0.4)	0.7 (0.5,0.9)	0.4
Juice Drinks	0.3 (0.2,0.4)	0.6 (0.4,0.7)	0.3	0.3 (0.2,0.5)	0.9 (0.7,1.1)	0.6
Water	0.5 (0.4,0.6)	0.9 (0.7,1.0)	0.4	0.7 (0.5,0.8)	1.4 (1.3,1.6)	0.7

Table 3: Difference-in-Difference Estimates of Interior Marketing Displays Comparing Seattle and Comparison Areas at Baseline and 12-months post Sweetened Beverage Tax

	DID ^{1,2}		
	Estimate	(90%CI)	P-value
<i>Sugar Sweetened Beverages</i>			
SSB composite score	0.85	(0.71, 1.01)	0.121
Soda	0.80	(0.66, 0.98)	0.066*
Energy Drinks	1.44	(0.91, 2.28)	0.191
Sports Drinks	0.64	(0.39, 1.04)	0.132
Juice Drinks	0.83	(0.61, 1.13)	0.315
<i>Non-Sugar Sweetened Beverages</i>			
Non-SSB composite score	0.89	(0.73, 1.07)	0.301
Diet Soda	0.74	(0.60, 0.91)	0.016*
Diet Energy Drinks	1.93	(1.11, 3.36)	0.051*
Diet Sports Drinks	1.50	(0.73, 3.09)	0.352
100% Juice Drinks	0.75	(0.48, 1.19)	0.305
Water	0.80	(0.60, 1.07)	0.203

¹ Difference-in-difference estimate

² DID estimates are adjusted for week of data collection and fixed store effects

*Significant at the 0.10 level

Table 4a: Sensitivity Analysis for Interior Marketing Displays as a Composite Score

	DID ¹	
	estimate	P-value
Sugar Sweetened Beverages		
Standard ^a	0.85	0.121
SA #1^b	0.71	0.010*
SA #2 ^c	0.82	0.321
Non-Sugar Sweetened Beverages		
Standard ^a	0.89	0.301
SA #1^b	0.78	0.055*
SA #2 ^c	0.87	0.505
SA #3 ^d	0.91	0.476

¹ Difference-in-difference estimate

^a Adjusting for store fixed effects and week of data collection

^b Sensitivity Analysis 1: Using end aisle displays only, adjusting for store fixed effects and week of data collection

^c Sensitivity Analysis 2: Adjusting for store type (grocery store, supermarket, and superstore) and week of data collection

^d Sensitivity Analysis 3: Removing bottled water from the Non-SSB composite score, adjusting for store fixed effects and week of data collection

*Significant at the 0.10 level

Table 4b: Sensitivity Analysis for Interior Marketing Displays as Individual Beverages

	DID ¹	
	Estimate	P-value
Soda		
Standard^a	0.80	0.066*
SA #1^b	0.71	0.005*
SA #2 ^c	0.82	0.299
Diet Soda		
Standard^a	0.74	0.016*
SA #1^b	0.76	0.033*
SA #2 ^c	0.71	0.118
Energy Drink		
Standard ^a	1.44	0.191
SA #1 ^b	1.00	0.996
SA #2 ^c	1.42	0.345
Diet Energy Drink		
Standard^a	1.93	0.051*
SA #1 ^b	1.09	0.843
SA #2 ^c	2.01	0.122
Sports Drink		
Standard ^a	0.64	0.132
SA #1^b	0.43	0.026*
SA #2 ^c	0.65	0.327
Diet Sports Drink		

Standard ^a	1.50	0.352
SA #1 ^b	1.36	0.501
SA #2 ^c	1.59	0.471

Juice

Standard ^a	0.83	0.315
SA #1 ^b	0.80	0.275
SA #2 ^c	0.67	0.150

100% Juice

Standard ^a	0.75	0.305
SA #1 ^b	0.68	0.188
SA #2 ^c	0.67	0.280

Water

Standard ^a	0.80	0.203
SA #1^b	0.70	0.092*
SA #2 ^c	0.83	0.460

¹ Difference-in-difference estimate

^a Adjusting for store fixed effects and week of data collection

^b Sensitivity Analysis 1: Using end aisle displays only, adjusting for store fixed effects and week of data collection

^c Sensitivity Analysis 2: Adjusting for store type (grocery store, supermarket, and superstore) and week of data collection

*Significant at the 0.10 level

Appendix

Appendix 1a: End Aisle Display



Appendix 1b: Special Floor Display



Appendix 2: Re-survey Rates of Baseline and Post-tax Stores in Seattle and Comparison Area

	Seattle			Comparison		
	Baseline N	Post-Tax N	Re-survey rate	Baseline N	Post-Tax N	Re-survey rate
<i>Supermarket Type</i>						
Grocery Store	12	11	91.7	13	11	84.6
Supermarket	24	20	83.3	11	11	100.0
Superstore	34	27	79.4	14	12	85.7
Total	70	58	82.9	38	34	89.5

