Received 4/13/2018 12:03:34 PM Supreme Court Eastern District

Filed 4/13/2018 12:03:00 PM Supreme Court Eastern District
2 EAP 2018

IN THE SUPREME COURT OF PENNSYLVANIA

Docket Nos. 2, 3 EAP 2018

LORA JEAN WILLIAMS; GREGORY J. SMITH; CVP MANAGEMENT, INC. d/b/a or t/a CITY VIEW PIZZA; JOHN'S ROAST PORK, INC. f/k/a JOHN'S ROAST PORK; METRO BEVERAGE OF PHILADELPHIA, INC. d/b/a or t/a METRO BEVERAGE; DAY'S BEVERAGES, INC. d/b/a or t/a DAY'S BEVERAGES; AMERICAN BEVERAGE ASSOCIATION; PENNSYLVANIA BEVERAGE ASSOCIATION; PHILADELPHIA BEVERAGE ASSOCIATION; and PENNSYLVANIA FOOD MERCHANTS ASSOCIATION

Plaintiffs-Appellants,

v.

CITY OF PHILADELPHIA and FRANK BRESLIN, IN HIS OFFICIAL CAPACITY AS COMMISSIONER OF THE PHILADELPHIA DEPARTMENT OF REVENUE,

Defendants-Appellees.

BRIEF OF *AMICUS CURIAE* CITY OF BERKELEY IN SUPPORT OF APPELLEES

On appeal from an Order of the Commonwealth Court of Pennsylvania, in Nos. 2077, 2078 C.D. 2016, entered June 14, 2017, affirming Orders of the Court of Common Pleas of Philadelphia County, entered December 19, 2016, September Term 2016, No. 01452

Farimah F. Brown, City Attorney*
California State Bar No. 96372
Jessica E. Mar, Deputy City Attorney*
California State Bar No. 293304
BERKELEY CITY ATTORNEY'S OFFICE
2180 Milvia St., 4th Floor
Berkeley, California 94704
Telephone: (510) 981-6998

Counsel for Amicus Curiae, City of Berkeley
(Additional Counsel Listed on Inside Cover)

Michael J. Boni (PA Bar ID. 52983)
Joshua D. Snyder (PA Bar ID. 88657)
John E. Sindoni (PA Bar ID. 91729)
BONI, ZACK & SNYDER LLC
15 St. Asaphs Road
Bala Cynwyd, PA 19004
Telephone: (610) 822-0200

Additional Counsel for Amicus Curiae, City of Berkeley

* Participating as counsel for *Amicus Curiae* the City of Berkeley pursuant to 204 Pa. Code § 81.502(a) ("Admission pro hac vice shall not be required in order to participate in a case solely as amicus curiae.")

TABLE OF CONTENTS

TABLE OF AUTHORITIES

Page(s)

Pennsylvania Court Rules

Other Authorities

Exhibits:

I. Statement of Identity and Interest of *Amicus Curiae*[1]

The City of Berkeley is a charter city, organized and operating under the laws of the State of California and located in the County of Alameda. The original Town of Berkeley was incorporated on April 4, 1878 by an Act of the California State Legislature. The first Charter was adopted under authority of the California State Constitution and approved by the legislature on March 5, 1895. In the most recent 2010 United States Census, the City of Berkeley had a population of 112,580 residents.

In this amicus brief, the City of Berkeley offers its experience with its own sugar-sweetened beverage tax, which shares many characteristics with the Philadelphia Beverage Tax at issue in this case. The City of Berkeley presents this brief in support of the City of Philadelphia and Frank Breslin, in his official capacity as Commissioner of the Philadelphia Department of Revenue, to demonstrate that a per-fluid-ounce tax on the distribution of sugar-sweetened beverage products within a municipality can operate smoothly and effectively to achieve public health goals and raise revenue to support important municipal services and programs.

---

[1] Pursuant to Pennsylvania Rule of Appellate Procedure 531(b)(2), the City of Berkeley states that no one other than the amicus or its counsel paid for the preparation of this brief or authored this brief, in whole or in part.

II. Summary of Argument

On November 4, 2014, the voters of the City of Berkeley passed Measure D, which effected a one-cent-per-ounce excise tax on the distribution of "sugar-sweetened beverage products" in the City of Berkeley with the explicit legislative intent "to diminish the human and economic costs of diseases associated with the consumption of sugary drinks by discouraging their distribution and consumption in Berkeley through a tax." The City of Berkeley became the first United States jurisdiction to levy such a tax.

Since its implementation in 2015, Berkeley's Sugar-Sweetened Beverage ("SSB") tax has been subject to a number of assessments, studies, and evaluations. Quantitative analysis of beverage price data and consumer consumption research indicate that Berkeley's tax reduced SSB consumption and has been an effective tool to address public health goals. In-depth interviews with distributors, retailers, and Berkeley's tax administrator confirm that implementation of the tax has gone smoothly and has not led to any significant unintended market distortions or dislocations.

Berkeley's SSB tax has not only been an effective tool in addressing public health concerns, but has also generated over $3.57 million in general fund revenue for the City of Berkeley since its implementation in March of 2015. This additional revenue has enabled the City to fund a number of valuable community

nutrition, education, and physical activity programs to promote the health of Berkeley residents.

III. Argument

The City of Berkeley submits this brief in support of the Appellees, the City of Philadelphia and Frank Breslin, in his official capacity as Commissioner of the Philadelphia Department of Revenue, who are seeking to implement the duly enacted Philadelphia Beverage Tax.

Berkeley's Sugar-Sweetened Beverage tax, which has operated successfully since March of 2015, shares many characteristics with the Philadelphia Beverage Tax. Based on Berkeley's experience, a per-fluid-ounce tax on the distribution of sugar-sweetened beverages within a municipality can operate smoothly and effectively to achieve public health goals and raise revenue to support important municipal services.

A. The City of Berkeley Has Successfully Implemented a Sugar-Sweetened Beverage Tax Since 2015

Consumption of sugar-sweetened beverages is linked to increased risk of obesity, diabetes, cardiovascular risk factors, and tooth decay, among other conditions.[2] Sugary drinks such as soft drinks, energy drinks, sweetened teas, and

[2] World Health Org., *Guideline: Sugars intake for adults and children: Executive Summary* (2015). A copy of this document is attached as Exhibit A.

sports drinks offer little or no nutritional value, but contain large amounts of added sugar.

In November 2014, seventy-six percent of Berkeley voters supported a measure to adopt a one-cent-per-fluid-ounce[3] general excise tax on the distribution of "sugar-sweetened beverage products" in the City of Berkeley.[4] The explicit legislative intent of City of Berkeley's SSB tax was "to diminish the human and economic costs of diseases associated with the consumption of sugary drinks by discouraging their distribution and consumption in Berkeley through a tax" on "the distribution of sugary drinks and the products used to make them." Berkeley Ord. No. 7388-N.S. § 2.A. Berkeley's SSB tax is codified in Chapter 7.72 of the Berkeley Municipal Code ("BMC") and appended to this brief as Exhibit B.

Distribution of products like soda, energy drinks, and heavily presweetened tea, as well as the "added caloric sweeteners"[5] used to produce them, such as the

---

[3] For sugar-sweetened beverages, the tax is assessed on the volume of the beverage distributed to any person in the course of business in the City. Berkeley Municipal Code ("BMC") 7.72.010.B.1. For purposes of added caloric sweeteners, the tax is assessed on the largest volume, in fluid ounces, that would typically be produced from the added caloric sweeteners based on the manufacturer's instructions or based on the regular practice of a distributor, if the distributor uses the added caloric sweeteners to produce a sugar-sweetened beverage. *Id.*

[4] A copy of the official public ordinance adopted by the voters is appended as Exhibit C.

[5] An "added caloric sweetener" is defined as any substance or combination of substances that meets all of the following four criteria: 1) Is suitable for human consumption; 2) Adds calories to the diet if consumed; 3) Is perceived as sweet when consumed; and 4) Is used for making, mixing, or compounding Sugar-sweetened beverages by combining the substance or substances with one or more other ingredients including, without limitation, water, ice, powder, coffee, tea, fruit juice, vegetable juice, or carbonation or other gas. BMC 7.72.030.A. "Added caloric sweetener" includes, without limitation, sucrose, fructose, glucose, other sugars, and high

syrup used to make fountain drinks are subject to this tax. BMC 7.72.010. Drinks such as infant formula, milk products, beverages for medical use, alcoholic beverages, and natural fruit and vegetable juice are exempt from the tax. BMC 7.72.030.O.2. The tax is required to be paid on the first nonexempt distribution of a sugar-sweetened beverage product in the City of Berkeley; the distribution of sugar-sweetened beverage products may not be taxed more than once in the chain of commerce. BMC 7.72.010.C.

B. The Implementation of Berkeley's Sugar-Sweetened Beverage Tax Was Smooth

The City of Berkeley's SSB tax was adopted by the voters in November 2014, and the election was certified in December 2014. The tax went into effect on January 1, 2015, but the City of Berkeley adopted a phased approach and delayed the effective collection date for 60 days in order to give the City and the industry time to prepare for and execute the implementation. Implementation was contracted out to MuniServices LLC, a national firm that specializes in tax administration for state and local governments.

For the first year (2015), Berkeley limited collection to large scale distributors of sugar sweetened beverages and related products, such as fountain syrups. This rollout went smoothly. Business licenses, professional affiliations,

---

fructose corn syrup, but does not include a substance that exclusively contains natural, concentrated, or reconstituted fruit or vegetable juice or any combination thereof. *Id.*

and the tax administrator's database were used to quickly identify liable distributors and to provide outreach for taxpayer education sessions. Taxpayers were informed sufficiently in advance that few, if any, penalties were incurred. There have been no disputes or lawsuits and few questions that MuniServices was not able to answer without consulting the City.

The tax was rolled out to smaller "self-distributors"[6] in 2016, using a similar approach, but with additional individual contact for these small business owners. There have been a few questions as to how the tax applies at its margins, but again, no significant disputes.

An implementation assessment based on in-depth interviews with SSB distributors, Berkeley beverage retailers, City of Berkeley public health, finance, and legal staff, City Commissioners serving on the Berkeley Sugar Sweetened Beverage Panel of Experts, and MuniServices, the tax administrator, found high rates of reported distributor compliance and smooth implementation. The reported compliance rate in April 2016 was 94.74% of covered distributors filing and paying the SSB tax.[7] In an interview a tax administrator described the

---

[6] "Self-distributors" are retailers who obtain and bring sugar-sweetened beverages into the City themselves, for instance, smaller retailers (or restaurateurs) who may purchase several cases of sodas at a retail establishment such as Costco or Walmart and then bring them into the City for retail sale. BMC 7.72.030.H.

[7] Thirty-six of the thirty-eight distributors required to file and remit the tax did so in April 2016. Jennifer Falbe, et al., *Implementation Evaluation of Berkeley's Measure D: Report to the City of Berkeley* ("*June 2016 Evaluation*"), 5 (June 2016). For the Court's convenience, copies of the

implementation of the tax as "relatively painless."[8] The study found that the simplicity of the tax-per-ounce structure facilitated implementation of the tax. A tax administrator noted that "[Calculation of the tax] is actually really simple. [In contrast], tobacco is based, on per pack or per carton, per cigar or per little cigar. They have like 20 different things."[9] A distributor also remarked on the simplicity of Berkeley's SSB, stating that "the calculation and payment of it is fairly simple now that it is up and running."[10] The majority of self-distributors interviewed did not report difficulty understanding how to calculate the tax.[11]

While many retailers reported a drop in sales of SSBs, especially soda—the intended effect of the SSB tax—most retailers reported no or only minor impacts on overall business or sales.[12] A study found that one year after Berkeley's implementation of its SSB tax, prices of SSBs increased in many, but not all, settings, SSB sales declined by 9.6% , and sales of untaxed beverages (especially water) increased, and overall beverage sales rose in Berkeley.[13] The study also

---

referenced studies and reports are appended to this brief as exhibits. A copy of this report is appended as Exhibit D.

[8] *Id.*

[9] *Id.*

[10] *Id.*

[11] Jennifer Falbe, et al., *Implementation Evaluation of Berkeley's Measure D: Report to the City of Berkeley* ("*Sept. 2016 Evaluation*"), 5 (Sept. 2016). A copy of the report is appended as Exhibit E.

[12] *June 2016 Evaluation* at 9.

[13] Lynn Silver, et al., *Changes in prices, sales, consumer spending, and beverage consumption one year after a tax on sugar-sweetened beverages in Berkeley, California, US: A before-and-*

found that consumer spending per transaction (average grocery bill) did not increase, and there was no evidence of loss of gross revenue per transaction or decreases in overall beverage sales for stores.[14]

Another study examining the impact on business and jobs found that a year and a half after passage of Berkeley's SSB tax, food sector sales tax revenue rose by 15% in the city, and 469 new food sector jobs were created—an increase of 7.2%.[15]

Taken together, the two studies indicate that Berkeley's SSB tax is having its intended effect—consumers are shifting to healthier beverage options, average grocery bills did not rise in response to the tax, and Berkeley has been able to raise significant revenue that has been used to promote the health of Berkeley's residents.

C. Berkeley's Sugar-Sweetened Beverage Tax Had the Intended Effect of Higher Retail Shelf Prices for Sugar-Sweetened Beverages

Berkeley's SSB tax had the explicit legislative intent "to diminish the human and economic costs of diseases associated with the consumption of sugary drinks by discouraging their distribution and consumption in Berkeley through a tax."

---

after study ("*Changes in prices, sales, consumer spending, and beverage consumption*") 2-3 (April 18, 2017). PLoS Med. 14(4): e1002283. A copy of this study is appended as Exhibit F.

[14] *Id.*

[15] Lynn Silver, Pub. Health Instit., *Berkeley's Sugar Sweetened Beverage Tax: What Happened to Jobs & Business Revenue?* (May 2017). A copy of this report is appended as Exhibit G.

The Berkeley SSB tax cannot be passed on to consumers as an added charge at the register or invoiced as a tax or surcharge at the point of retail sale to consumers. However, the tax does not prohibit retailers from making private business decisions to increase shelf pricing to pass on all or a portion of the incidence of the tax to consumers.

Unlike a sales tax, which is added at the register and paid directly by the consumer, an excise tax is levied on the distribution of SSBs prior to the point of purchase. In response to an excise tax, distributors are expected to increase SSB prices for retailers, who are expected to increase the shelf prices of SSBs paid by consumers. Excise taxes are thought to have a greater deterrent impact on consumer purchasing because they result in higher shelf prices at the point of decision.

The effectiveness of an excise tax in reducing consumption hinges in part on the "pass-through rate," or the extent to which the tax is passed on to consumers through higher shelf prices, thereby decreasing consumption. In a longitudinal study of seventy-one stores, researchers from the University of California, Berkeley and the University of North Carolina, Chapel Hill, found that three months after the tax was implemented 69% of Berkeley's SSB tax was passed on through higher shelf prices for sodas and 47% was passed through to prices of

other sugary beverages subject to the tax for beverages less than 33.8 ounces.[16] Two-liter bottles and multipacks of soda demonstrated slightly lower pass-through rates, with relative price increases of 46% and 49% respectively. The study findings that the tax was passed through to shelf prices at higher rates for sodas is encouraging because of the particular health concerns associated with high rates of soda consumption.[17]

The study found that the price of SSBs overall increased relative to the price of non-SSBs by 0.46 cents per ounce more in Berkeley than in comparison cities and that broader categories of untaxed beverages, such as diet soda, water, milk, orange juice, and non-SSBs did not significantly increase in price in Berkeley relative to comparison cities during the same time period.[18]

Researchers from the Public Health Institute and Department of Nutrition and the Carolina Population Center at the University of North Carolina at Chapel Hill analyzed a survey of beverage prices at 26 Berkeley stores prior to and after the implementation of the tax, point-of-sale scanner data on 15.5 million checkouts

---

[16] Jennifer Falbe, et al., *Higher Retail Prices of Sugar-Sweetened Beverages 3 Months After Implementation of an Excise Tax in Berkeley, California*, 105 Am. J. Pub. Health 2194 (2015). A copy of this article is appended as Exhibit H.

[17] Implementation evaluations indicate that Coke and Pepsi invoices clearly identified the specific beverages for which retailers were charged more as a result of the SSB tax, while other distributors may have lumped the SSB tax with other charges on the invoices or not clearly identified which products were subject to the SSB tax. *June 2016 Evaluation* at 6.

[18] Jennifer Falbe, et al., *Higher Retail Prices of Sugar-Sweetened Beverages 3 Months After Implementation of an Excise Tax in Berkeley, California*, 105 Am. J. Pub. Health 2198 (2015).

for beverage prices, sales, and store revenue, and a telephone survey of 957 adult Berkeley residents, to examine the pass-through rate of the SSB tax on retail prices.[19] They concluded that the tax was generally functioning as intended. The study found complete pass-through for SSBs sold at large chain supermarkets (1.07 cents), small chain supermarkets (1.31 cents), and chain gas stations (1.31 cents).[20] Chain pharmacies partially passed-through the rate among SSBs (0.45 cents) and untaxed beverages and pass-through did not occur in independent small markets or gas stations.[21]

Based on analysis of retail scanner data, the study concluded that one year after the SSB tax was implemented, SSB sales in Berkeley stores declined 9.6% compared to estimates if the tax were not in place, and rose 6.9% for non-Berkeley stores.[22] The study found that overall beverage sales rose across stores, and in Berkeley sales of water rose by 15.6%, exceeding the decline of SSBs sales in ounces.[23]

In-depth interviews with stakeholders affected by or involved in the implementation of the measure also indicate that the SSB tax functioned as intended and did not lead to any significant unintended market distortions or

---

[19] *Changes in prices, sales, consumer spending, and beverage consumption* at 2.
[20] *Id.*
[21] *Id.*
[22] *Id.* at 3.
[23] *Id.* at 11.

dislocations. Among retailers that decided to make up for higher costs from distributors due to the SSB tax, the majority reported raising the price of only taxed SSBs.[24] There was no indication that additional costs caused by the SSB tax were shifted to non-beverage items, such as food, to distort into a broad-based "grocery tax." In fact, not a single retailer reported raising the price of non-beverage items as a result of the tax.[25] The interviews are consistent with the results of an assessment of retail scanner data on 15.5 million checkouts for beverage prices, sales, and store revenue, which found that overall consumer spending per transaction (average grocery bill) did not rise in Berkeley after implementation of the SSB tax.[26]

D. Berkeley's Sugar-Sweetened Beverage Tax Was Associated with Decreased Consumption of Sugar-Sweetened Beverages

To measure the tax's impact on consumption, researchers conducted pre- and post-tax surveys on beverage consumption in Berkeley's low income neighborhoods, and used neighboring Oakland and San Francisco, geographically proximate and culturally and political[27] similar localities, as comparison cities to

---

[24] *Sept. 2016 Evaluation* at 4-5; *June 2016 Evaluation* at 9.
[25] *Sept. 2016 Evaluation* at 5.
[26] *Changes in prices, sales, consumer spending, and beverage consumption* at 13.
[27] For example, San Francisco also had a November 2014 ballot initiative to enact a per-ounce-tax on soft drinks supported by the majority of voters, garnering 55.6% of the vote. However, the San Francisco tax was not enacted because it required two-thirds of the vote to pass because funds from the tax were directed to a special fund, not the general fund.

account for general local trends unrelated to Berkeley's SSB.[28] Survey results showed a 21% decrease in SSB consumption in Berkeley, while comparison cities showed a 4% increase in SSB consumption.[29] The same research indicated a 63% increase in water consumption in Berkeley, with comparison cities showing only a 19% increase.[30] Additionally, consumption of soda and energy drinks decreased in Berkeley 26% and 36% respectively, while consumption of soda and energy drinks increased in comparison cities by 10% and 16% respectively.[31]

Another study found that sales in ounces of taxed SSBs fell by 9.6% in relation to predicted sales in the absence of the tax, while sales of untaxed beverages rose 3.5% and total beverage sales rose in Berkeley.[32] The authors concluded that the sales of SSBs declined significantly, consistent with published price elasticity estimates.[33]

Researchers at the Celsus Academy for Sustainable Healthcare at Radboud University Medical Center and the Department of Social Medicine at the Academic Medical Center in the Netherlands conducted a review of the policy content and

---

[28] Jennifer Falbe, et al., *Impact of the Berkeley Excise Tax on Sugar- Sweetened Beverage Consumption*, 106 Am. J. Pub. Health 1865 (2016). A copy of this public journal article is appended as Exhibit I. The study included a sample of 328 pre-tax interviews in Berkeley and 662 in comparison cities and 545 interviews post-tax implementation in Berkeley and 1144 in the comparison cities.
[29] *Id.* at 1869.
[30] *Id.* at 1868.
[31] *Id.*
[32] *Changes in prices, sales, consumer spending, and beverage consumption* at 3.
[33] *Id.*

context for thirteen case studies, including the City of Berkeley, of taxation of unhealthy energy-dense foods and SSB taxes.[34] The researchers concluded that the available evaluations of the 13 case studies indicated that consumers did change the behavior, that the consumption of targeted products decreased, and the effect seemed larger among lower socioeconomic groups.[35]

These findings indicate that Berkeley's SSB tax is an effective tool in achieving the goal of decreasing consumption of SSBs and the negative health impacts associated with their consumption.

E. Berkeley's Sugar-Sweetened Beverage Tax has Raised Revenue and Enabled Berkeley to Fund Community Nutrition and Health Programs and Education and Media Campaigns

The tax revenue generated by the SSB tax goes into the City of Berkeley's general fund. From March 2015,[36] when the City of Berkeley started collecting the tax, through the end of January 2018, the City has collected over $3.57 million in revenue. The ballot measure that instituted the SSB tax also provided for the establishment of a Sugar-Sweetened Beverage Products Panel of Experts (SSBPPE) to advise the City Council on "how and to what extent the City should

---

[34] Luc Hagenaars, et al., *The taxation of unhealthy energy-dense foods (EDFs) and sugar-sweetened beverages (SSBs): An overview of patterns observed in the policy content and policy context of 13 case studies*, 121 Health Policy 887-894 (2017). A copy of this article is attached as Exhibit J.

[35] *Id.* at 891.

[36] The tax took effect on January 1, 2015. However, the first month distribution was taxable was March 2015. Certain small self-distributors were required to file their SSB tax for the month of January 2016, with the remittances due before the end of February 2016.

fund programs to further reduce the consumption of sugar-sweetened beverages (SSBs) in Berkeley and address the consequences of such consumption."

The additional general fund revenue raised by the SSB tax has enabled the City of Berkeley to increase spending on nutrition, education, and outreach programs. The SSBPPE, made up of experts in child nutrition, healthcare, and education, makes recommendations to the City Council about funding programs to reduce the consumption of sugar-sweetened beverages in Berkeley and address the consequences of such consumption.

To date, at the recommendation of the SSBPPE, the Berkeley City Council has approved a total allocation of $5 million dollars (through June 30, 2019) to fund community nutrition and health programs, education and media campaigns, and to support the program management and evaluation of these programs.

The City uses an open request for proposals process to solicit applications from community agencies that qualify for funding based eligibility criteria developed by the SSBPPE Commission as part of its Healthy Berkeley Program. Two independent review panels of SSBPPE commissioners and public health staff evaluate and score the proposals. Recommendations for funding are then submitted to the Berkeley City Council for consideration.

In the first year of the Healthy Berkeley Program (July 2016- July 2017), the City of Berkeley awarded $1,287,500 to fund seven community-based programs to

reduce the consumption of SSBs and the associated negative health outcomes.[37] This funding supported education and outreach to over 10,000 Berkeley residents.

Grantees and mini-grantees educated over 7,000 Berkeley Unified School District students and parents with newly developed curriculum focused on SSBs and nutrition, distributed over 1,500 water bottles, organized dance and music education for over 700 children, provided 99 residents with free diabetes prevention program, trained more than 60 youth and parents in leadership skills, and worked in seventeen schools across the city.[38]

The programs that the City of Berkeley funds are focused on improving the health of Berkeley residents and engaging traditionally difficult-to-reach communities. For example, the City of Berkeley awarded a grant to Berkeley Unified School District ("BUSD"), the local school district, to expand the cooking and gardening program aimed at reducing the number of students with nutrition related illnesses, especially among African American and Latino students. The program engaged students in preschool through high school with hands-on instructions in science, language art, environment and nutrition education in

---

[37] The Healthy Berkeley Program included a grant to LifeLong Medical Center that oversaw a mini-grantee program that funded seven new organizations with smaller grants of around $10,000 each. The mini-grantees reported reaching thousands of Berkeley residents, with an emphasis on underserved communities, such as non-English speakers and people recovering from addiction. John Snow Inc., *Evaluation of the Healthy Berkeley Program: Executive Summary* (Jan. 2018) at 5. A copy of this report is appended as Exhibit K.

[38] *Id.*

seventeen school gardens. The program aimed to improve access to water, increase knowledge and awareness of the health risks of consuming sugary drinks, change preferences for water or other non-sugar added drinks, and increase family engagement.

The City of Berkeley also funded a local non-profit to implement a multi-strategy approach to reduce health inequities in Berkeley resulting from consumption of sugar-sweetened beverages through behavioral and environmental change. The non-profit conducted community assessment surveys and focus groups among African American families in West and South Berkeley, and trained community residents as water ambassadors to conduct outreach and provide education about health inequities and health effects of sugar-sweetened beverages.

Another partner organized community activities including a healthy eating orientation for incoming high school students, free pre-diabetes risk screenings, and training for youth health ambassadors to lead teen outreach activities.

The City of Berkeley funded a diabetes prevention program that provided a trained lifestyle coach for populations at higher risk for diabetes, obesity, and tooth decay and provided a 16-week core and monthly maintenance training program based on a low fat diet, education about calories, and guidance on how to manage stress, social eating, and daily physical activity aimed at losing body weight and making healthier food and beverage choices.

The City of Berkeley also supported a program that incorporates education and physical activity programs to promote healthy weight, nutrition, and physical activity habits among young children and their families. The program provides bi-lingual (English/Spanish) educational workshops on healthy nutrition and meal planning for parents of children in Head Start and the BUSD preschool programs, weekly physical education, and dance classes. The program trains teachers on infusing motor activity and nutrition and health education into their curriculums.

The Healthy Berkeley Program strives to engage traditionally difficult-to-reach communities, change the perceptions around SSBs, support shifts toward healthier behavior, and cultivate leadership skills among Berkeley residents. An assessment of the first year of the Healthy Berkeley Program found a high degree of alignment between the grantees' activities in year one and the Healthy Berkeley Program goals.[39] While these programs are still in their early stages, the City of Berkeley anticipates that they will have a positive impact on the health of Berkeley residents.

IV. Conclusion

The City of Berkeley has successfully implemented a tax on the distribution of SSBs and the products used to make them since 2015. Evaluations and assessments of the tax indicate that the tax has met its intended goals: the tax has

[39] John Snow, Inc., *Evaluation of the Healthy Berkeley Program: Exec. Summary* at 7.

led to an increase in the shelf-price of SSBs, a decrease in consumption of SSBs, and a shift towards healthier beverage options. The tax has also raised significant general fund revenue for the City of Berkeley.

Dated: April 13, 2018.

Respectfully submitted,

Fatmah F. Brown, City Attorney*
Jessica E. Mar, Deputy City Attorney*
California State Bar No. 293304
BERKELEY CITY ATTORNEY'S OFFICE
2180 Milvia St., 4th Floor
Berkeley, California 94704
Telephone: (510) 981-6998

Michael J. Boni (PA Bar ID. 52983)
Joshua D. Snyder (PA Bar ID. 88657)
John E. Sindoni (PA Bar ID. 91729)
BONI, ZACK & SNYDER LLC
15 St. Asaphs Road
Bala Cynwyd, PA 19004
Telephone: (610) 822-0200

Counsel for Amicus Curiae, City of Berkeley

* Participating as counsel for *Amicus Curiae* the City of Berkeley pursuant to 204 Pa. Code § 81.502(a) ("Admission pro hac vice shall not be required in order to participate in a case solely as amicus curiae.")

CERTIFICATION OF WORD COUNT

In accordance with the Pennsylvania Rules of Appellate Procedure, undersigned counsel for the *Amicus Curiae* City of Berkeley certifies that this Brief complies with the type-volume and typeface requirements of the Rules of Appellate Procedure because this brief contains 4,438 words, excluding parts of the brief exempted by the Rules of Appellate Procedure. This brief has been prepared in a proportionally spaced typeface using the 2013 version of Microsoft Word in 14 point Times New Roman font with footnotes in 12 point Times New Roman font.

Joshua D. Snyder (PA Bar ID. 88657)
BONI, ZACK & SNYDER LLC
15 Saint Asaphs Road
Bala Cynwyd, PA 19004
(610) 822-0200

Dated: April 13, 2018

CERTIFICATE OF COMPLIANCE WITH PUBLIC ACCESS POLICY

Undersigned counsel for the *Amicus Curiae* City of Berkeley certifies that this filing complies with the provisions of the *Public Access Policy of the Unified Judicial System of Pennsylvania: Case Records of the Appellate and Trial Courts* that require filing confidential information and documents differently than non-confidential information and documents.

Joshua D. Snyder (PA Bar ID. 88657)
BONI, ZACK & SNYDER LLC
15 Saint Asaphs Road
Bala Cynwyd, PA 19004
(610) 822-0200

Dated: April 13, 2018

EXHIBIT A

World Health Organization

Guideline:

Sugars intake for adults and children

Guideline:

Sugars intake for adults and children

World Health Organization

WHO Library Cataloguing-in-Publication Data

Guideline: sugars intake for adults and children.

1.Carbohydrates. 2.Dietary Sucrose – administration and dosage. 3.Dental Caries – prevention and control. 4.Obesity – prevention and control. 5.Chronic Disease – prevention and control. 6.Energy Intake. 7.Food Habits. 8.Recommended Dietary Allowances. 9.Guideline. 10.Adult. 11.Child. I.World Health Organization.

ISBN 978 92 4 154902 8 (NLM classification: QU 145.7)

Design and layout: Alberto March
Printed by the WHO Document Production Services, Geneva, Switzerland

Suggested citation Guideline: Sugars intake for adults and children. Geneva: World Health Organization; 2015.

Contents

Acknowledgements

Technical support

This guideline was coordinated by Dr Chizuru Nishida, Coordinator of the Nutrition Policy and Scientific Advice Unit (NPU) in the WHO Department of Nutrition for Health and Development (NHD), with technical support and inputs from Dr Jason Montez, Technical Officer, NPU, and Dr Francesco Branca, Director, NHD. WHO gratefully acknowledges the technical input and expert advice provided by the members of the WHO Nutrition Guidance Expert Advisory Group Subgroup on Diet and Health, and by the external experts and resource persons for the development of this guideline, including the authors of the background systematic reviews. WHO also recognizes the valuable contributions made by the external peer reviewers and interested stakeholders who provided comments in response to public consultation.

Thanks are due to the members of the WHO Steering Committee for Nutrition Guidelines Development and the WHO Guidelines Review Committee (GRC) for their support and guidance throughout the guideline development process; special appreciation is given to Dr Susan Norris, GRC Secretariat, and Dr Charles Penn, Chair of GRC. Deep appreciation is expressed to Mr Issa Matta from the WHO Office of the Legal Counsel for his support and valuable guidance in the management of the conflicts of interest procedures. Special thanks are also due to colleagues in the WHO Department of Communications for their support with media communications throughout the guideline development process, particularly Ms Fadela Chaib, Mrs Kimberly Chriscaden, Ms Christine Feig, Mr Paul Garwood, Mr Gregory Hartl, Mr Tarik Jasarevic, Ms Olivia Lawe-Davies and Mr Glenn Thomas.

Acknowledgement is made to the staff of NPU, especially Ms Emma Kennedy, Assistant to the Coordinator, for providing administrative and logistic support throughout the guideline development process, and Ms Kaia Engesveen, Ms Line Vogt and Dr Katharina da Silva Lopes, for supporting the guideline publication process. WHO also acknowledges Dr Hilary Cadman from Cadman Editing Services in Australia for technical editing of this guideline, and Mr Alberto March from Grafmac Inc in Spain for the cover design and layout.

Financial support

WHO expresses special appreciation to the following offices, organizations and institutions, for providing financial support for the guideline development work:

- The Ministry of Health, Labour and Welfare of the Government of Japan;
- The Korean Food and Drug Administration, through grants to the Korea Health Industry Development Institute (a research institute affiliated to the Korean Government);
- Zhejiang University in Hangzhou, China; and
- The WHO Regional Office for Europe.

Abbreviations and acronyms

BMI	body mass index
CI	confidence interval
CVD	cardiovascular disease
eLENA	WHO e-Library of Evidence for Nutrition Actions
FAO	Food and Agriculture Organization of the United Nations
GINA	WHO Global database on the Implementation of Nutrition Action
GRADE	Grading of Recommendations Assessment, Development and Evaluation
NCD	noncommunicable disease
NGO	nongovernmental organization
NHD	WHO Department of Nutrition for Health and Development
NUGAG	WHO Nutrition Guidance Expert Advisory Group
OR	odds ratio
PICO	population, intervention, comparison and outcome
RCT	randomized controlled trial
SD	standard deviation
UK	United Kingdom of Great Britain and Northern Ireland
UN	United Nations
WHO	World Health Organization

Executive summary

Background

Noncommunicable diseases (NCDs) are the leading causes of death and were responsible for 38 million (68%) of the world's 56 million deaths in 2012 *(1)*. More than 40% of those deaths (16 million) were premature (i.e. under the age of 70 years). Almost three quarters of all NCD deaths (28 million), and the majority of premature deaths (82%), occurred in low- and middle-income countries. Modifiable risk factors such as poor diet and physical inactivity are some of the most common causes of NCDs; they are also risk factors for obesity[1] – an independent risk factor for many NCDs – which is also rapidly increasing globally (*2*). A high level of free sugars[2] intake is of concern, because of its association with poor dietary quality, obesity and risk of NCDs *(3, 4)*.

Free sugars contribute to the overall energy density of diets, and may promote a positive energy balance *(5-7)*. Sustaining energy balance is critical to maintaining healthy body weight and ensuring optimal nutrient intake *(8)*. There is increasing concern that intake of free sugars – particularly in the form of sugar-sweetened beverages – increases overall energy intake and may reduce the intake of foods containing more nutritionally adequate calories, leading to an unhealthy diet, weight gain and increased risk of NCDs *(9-13)*. Another concern is the association between intake of free sugars and dental caries *(3, 4, 14-16)*. Dental diseases are the most prevalent NCDs globally *(17, 18)* and, although great improvements in prevention and treatment of dental diseases have occurred in the past decades, problems still persist, causing pain, anxiety, functional limitation (including poor school attendance and performance in children) and social handicap through tooth loss. The treatment of dental diseases is expensive, consuming 5–10% of health-care budgets in industrialized countries, and would exceed the entire financial resources available for the health care of children in most lower income countries *(17, 19)*.

[1] Overweight and obesity are defined as follows:

- Children (<5 years):
  - Overweight: weight for height >+2 standard deviations (SD) of the WHO Child Growth Standards median
- School-aged children and adolescents (5–19 years):
  - Overweight: body mass index (BMI)-for-age >+1 SD of the WHO growth reference for school-aged children and adolescents (equivalent to BMI 25 kg/m² at 19 years)
  - Obesity: >+2 SD of the WHO growth reference for school-aged children and adolescents (equivalent to BMI 30 kg/m² at 19 years)
- Adults (≥20 years):
  - Overweight: BMI ≥25 kg/m²
  - Obesity: BMI ≥30 kg/m²

[2] The term "free sugars" was used by the 2002 Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases *(3)* when updating the population nutrient intake goals, which were originally established by the WHO Study Group in 1989 *(4)*. The term "free sugars" was referred to in the 2002 WHO/FAO Expert Consultation as "all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and fruit juices" *(3)*. However, as noted in the Remarks section under the Recommendations, the term has been further elaborated for this guideline by the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Diet and Health as follows: "Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates".

Objective

The objective of this guideline[1] is to provide recommendations on the intake of free sugars to reduce the risk of NCDs in adults and children, with a particular focus on the prevention and control of unhealthy weight gain and dental caries. The recommendations in this guideline can be used by policy-makers and programme managers to assess current intake levels of free sugars in their countries relative to a benchmark. They can also be used to develop measures to decrease intake of free sugars, where necessary, through a range of public health interventions.

Methods

WHO developed the present evidence-informed guideline using the procedures outlined in the *WHO handbook for guideline development (20)*. The steps in this process included:

- identification of priority questions and outcomes;
- retrieval of the evidence;
- assessment and synthesis of the evidence;
- formulation of recommendations;
- identification of research gaps; and
- planning for dissemination, implementation, impact evaluation and updating of the guideline.

Grading of Recommendations Assessment, Development and Evaluation (GRADE)[2] methodology was used to assess the quality of evidence identified through recent systematic reviews of the scientific literature on preselected topics related to free sugars intake. An international, multidisciplinary group of experts – the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Diet and Health – participated in the WHO technical consultations. The experts reviewed and discussed the evidence, drafted recommendations and reached consensus on the strength of the recommendations. They took into consideration desirable and undesirable effects of the recommendation, the quality of the available evidence, values and preferences related to the recommendation in different settings, and the cost of the options available to public health officials and programme managers in different settings. All members of the NUGAG Subgroup on Diet and Health, as well as external resource persons, completed a declaration of interests form before each meeting. An external expert and stakeholder panel was also involved throughout the process.

[1] This publication is a World Health Organization (WHO) guideline. A WHO guideline is a document, whatever its title, containing WHO recommendations about health interventions, whether they be clinical, public health or policy interventions. A recommendation provides information about what policy-makers, health-care providers or patients should do. It implies a choice between different interventions that have an impact on health and that have ramifications for the use of resources. All publications containing WHO recommendations are approved by the WHO Guideline Review Committee.

[2] http://www.gradeworkinggroup.org/

The evidence

Meta-analysis of randomized controlled trials (RCTs) in adults suggests an association between reduction of free sugars intake and reduced body weight. Increased intake of free sugars was associated with a comparable increase in body weight. The overall quality of the available evidence for adults was considered to be moderate.[1] RCTs in children – in which the interventions comprised or included recommendations to reduce sugar-sweetened foods and beverages – were characterized by generally low compliance, and showed no overall change in body weight. However, meta-analysis of prospective cohort studies, with follow-up times of 1 year or more, found that children with the highest intakes of sugar-sweetened beverages had a greater likelihood of being overweight or obese than children with the lowest intakes. The overall quality of the available evidence for an association between a reduction of free sugars intake and reduced body weight in children was considered to be moderate, whereas the quality of the evidence for an association between an increase in free sugars intake and increased body weight was considered to be low.

An analysis of cohort studies in children suggests a positive association between the level of free sugars intake and dental caries. The evidence suggests higher rates of dental caries when the level of free sugars intake is more than 10% of total energy intake compared with it being less than 10% of total energy intake. Furthermore, in three national population studies, lower levels of dental caries development were observed when per capita sugars intake was less than 10 kg/person/year (approximately 5% of total energy intake). Additionally, a positive log-linear dose-response relationship between free sugars intake and dental caries was observed across all studies, at free sugars intakes well below 10 kg/person/year (i.e. <5% of total energy intake). The overall quality of the available evidence from cohort studies was considered to be moderate, whereas that from the national population studies was considered to be very low.

Based on the entire body of evidence, WHO generated the following recommendations for free sugars intake in adults and children.

[1] Based on the grades of evidence set by the GRADE Working Group: **high quality**, we are very confident that the true effect lies close to that of the estimate of the effect; **moderate quality**, we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different; **low quality**, our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect; **very low quality**, we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of the effect.

Recommendations

- WHO recommends a reduced intake of free sugars throughout the lifecourse (*strong recommendation*[1]).
- In both adults and children, WHO recommends reducing the intake of free sugars to less than 10% of total energy intake[2] (*strong recommendation*).
- WHO suggests a further reduction of the intake of free sugars to below 5% of total energy intake (*conditional recommendation*[3]).

Remarks

- Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.
- For countries with a low intake of free sugars, levels should not be increased. Higher intakes of free sugars threaten the nutrient quality of diets by providing significant energy without specific nutrients *(3)*.
- These recommendations were based on the totality of evidence reviewed regarding the relationship between free sugars intake and body weight (low and moderate quality evidence) and dental caries (very low and moderate quality evidence).
- Increasing or decreasing free sugars is associated with parallel changes in body weight, and the relationship is present regardless of the level of intake of free sugars. The excess body weight associated with free sugars intake results from excess energy intake.
- The recommendation to limit free sugars intake to less than 10% of total energy intake is based on moderate quality evidence from observational studies of dental caries.
- The recommendation to further limit free sugars intake to less than 5% of total energy intake is based on very low quality evidence from ecological studies in which a positive dose–response relationship between free sugars intake and dental caries was observed at free sugars intake of less than 5% of total energy intake.

[1] **Strong recommendations** indicate that "the desirable effects of adherence to the recommendation outweigh the undesirable consequences" *(20)*. This means that "the recommendation can be adopted as policy in most situations" *(20)*.

[2] Total energy intake is the sum of all daily calories/kilojoules consumed from food and drink. Energy comes from macronutrients, such as fat (9 kcal/37.7 kJ per gram), carbohydrate (4 kcal/16.7 kJ per gram) including total sugars (free sugars + intrinsic sugars + milk sugars) and dietary fibre, protein (4 kcal/16.7 kJ per gram) and ethanol (i.e. alcohol) (7 kcal/29.3 kJ per gram). Total energy intake is calculated by multiplying these energy factors by the number of grams of each type of food and drink consumed and then adding all values together. A percentage of total energy intake is therefore a percentage of total calories/kilojoules consumed per day.

[3] **Conditional recommendations** are made when there is less certainty "about the balance between the benefits and harms or disadvantages of implementing a recommendation" *(20)*. This means that "policy-making will require substantial debate and involvement of various stakeholders" *(20)* for translating them into action.

- The recommendation to further limit free sugars intake to less than 5% of total energy intake, which is also supported by other recent analyses *(15, 16)*, is based on the recognition that the negative health effects of dental caries are cumulative, tracking from childhood to adulthood *(21, 22)*. Because dental caries is the result of lifelong exposure to a dietary risk factor (i.e. free sugars), even a small reduction in the risk of dental caries in childhood is of significance in later life; therefore, to minimize lifelong risk of dental caries, the free sugars intake should be as low as possible.
- No evidence for harm associated with reducing the intake of free sugars to less than 5% of total energy intake was identified.
- Although exposure to fluoride reduces dental caries at a given age, and delays the onset of the cavitation process, it does not completely prevent dental caries, and dental caries still progresses in populations exposed to fluoride *(23-35)*.
- Intake of free sugars is not considered an appropriate strategy for increasing caloric intake in individuals with inadequate energy intake if other options are available.
- These recommendations do not apply to individuals in need of therapeutic diets, including for the management of severe and moderate acute malnutrition. Specific guidelines for the management of severe and moderate acute malnutrition are being developed separately.

Introduction

Scope and purpose

Following the work of the 1989 WHO Study Group on Diet, Nutrition and Prevention of Noncommunicable Diseases *(4)*, the 2002 Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases *(3)* updated the guidance on the free sugars[1] intake as part of the guidance on population nutrient intake goals for the prevention of noncommunicable diseases (NCDs). Today, debate continues as to whether the available evidence of adverse health effects related to free sugars intake warrants appreciable reduction in free sugars intake. Therefore, it was considered important to review the existing evidence in a systematic manner, and update WHO's guidance on free sugars intake through the new WHO guideline development process.[2]

The objective of this guideline is to provide recommendations on the intake of free sugars to reduce the risk of NCDs in adults and children, with a particular focus on the prevention and control of unhealthy weight gain and dental caries. This is in recognition of the rapidly growing epidemic of overweight and obesity[3] around the globe and its role as a risk factor for several NCDs. In addition, dental caries is the most common NCD, and the cost of treatment places a heavy burden on health-care budgets in many countries. The recommendations in this guideline can be used by policy-makers and programme managers to assess current levels of free sugars intake in their countries relative to a benchmark. They can also be used to develop measures to decrease the intake of free sugars, where necessary, through a range of public health interventions.

The guideline will help Member States and their partners in making informed decisions about nutrition policies, programmes and interventions. It is hoped that the guideline will also help to accelerate the implementation of nutrition actions for improving health and development, and ultimately for reducing the burden of NCDs. The guideline is intended for a wide audience including government officials, scientists, the food industry and other partners involved in the development, design and implementation of policies and programmes in public health nutrition.

---

[1] The term "free sugars" was used by the 2002 Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases *(3)* when updating the population nutrient intake goals, which were originally established by the WHO Study Group in 1989 *(4)*. The term "free sugars" was referred to in the 2002 WHO/FAO Expert Consultation as "all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and fruit juices" *(3)*. However, as noted in the Remarks section under the Recommendations, the term has been further elaborated for this guideline by the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Diet and Health as follows: "Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates".

[2] See the section on "Guideline development process" (p.8) for more details.

[3] Overweight and obesity are defined as follows:

- Children (<5 years):
  - Overweight: weight for height >+2 standard deviations (SD) of the WHO Child Growth Standards median
- School-aged children and adolescents (5–19 years):
  - Overweight: body mass index (BMI)-for-age >+1 SD of the WHO growth reference for school-aged children and adolescents (equivalent to BMI 25 kg/m² at 19 years)
  - Obesity: >+2 SD of the WHO growth reference for school-aged children and adolescents (equivalent to BMI 30 kg/m² at 19 years)
- Adults (≥20 years):
  - Overweight: BMI ≥25 kg/m²
  - Obesity: BMI ≥30 kg/m²

This document presents the key recommendations and a summary of the supporting evidence. Further details of the evidence base are provided in Annex 1 and in other documents listed in the references.

Background

NCDs are the leading causes of death and were responsible for 38 million (68%) of the world's 56 million deaths in 2012 *(1)*. More than 40% of those deaths (16 million) were premature (i.e. under the age of 70 years). Almost three quarters of all NCD deaths (28 million), and the majority of premature deaths (82%), occurred in low- and middle-income countries. Modifiable risk factors such as poor diet and physical inactivity are some of the most common causes of NCDs; they are also risk factors for obesity – an independent risk factor for many NCDs – which is also rapidly increasing globally *(2)*. A high level of free sugars intake is of concern because of its association with poor dietary quality, obesity and risk of NCDs *(3, 4)*.

The term "sugars" includes intrinsic sugars, which are those incorporated within the structure of intact fruit and vegetables; sugars from milk (lactose and galactose); and free sugars, which are monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.

Because there is no reported evidence of adverse effects of consumption of intrinsic sugars and sugars naturally present in milk, the recommendations of this guideline focus on the effect of free sugars intake. For the first time in 1989, the WHO Study Group established a dietary goal for free sugars intake of less than 10% of total energy intake *(4)*, and this was reiterated by the Joint WHO/FAO Expert Consultation on Diet, Nutrition and the Prevention of Chronic Diseases in 2002 *(3)*.

Free sugars contribute to the overall energy density of diets, and may promote a positive energy balance *(5-7)*. Sustaining energy balance is critical to maintaining healthy body weight and ensuring optimal nutrient intake *(8)*. There is increasing concern that intake of free sugars – particularly in the form of sugar-sweetened beverages – increases overall energy intake and may reduce the intake of foods containing more nutritionally adequate calories, leading to an unhealthy diet, weight gain and increased risk of NCDs *(9-13)*. Another concern is the association between intake of free sugars and dental caries, which has received increasing interest in recent years *(3, 4, 14-16)*. Dental diseases are the most prevalent NCDs globally *(17, 18)* and, although great improvements in prevention and treatment of dental diseases have occurred in the past decades, problems still persist, causing pain, anxiety, functional limitation (including poor school attendance and performance in children) and social handicap through tooth loss. The treatment of dental diseases is expensive, consuming 5–10% of health-care budgets in industrialized countries, and would exceed the entire financial resources available for the health care of children in most lower income countries *(17, 19)*.

Guideline development process

This guideline was developed in accordance with the WHO evidence-informed guideline development procedures outlined in the *WHO handbook for guideline development (20)*.

Advisory groups

Development of this guideline was undertaken by the WHO Department of Nutrition for Health and Development (NHD), in partnership with the members of the WHO Secretariat (Annex 2). The work was guided by the WHO Steering Committee for Nutrition Guideline Development (Annex 3), which provided overall supervision of the guideline development process. The WHO Secretariat and the Steering Committee included representatives from all departments of WHO with an interest in the provision of scientific advice on nutrition. Two additional groups were formed – a guideline development group and an external peer-review group – as outlined below.

Guideline development group

The guideline development group – entitled the WHO Nutrition Guidance Expert Advisory Group (NUGAG) Subgroup on Diet and Health – was convened to support the development of this guideline (Annex 4). This group included experts who had previously participated in various WHO expert consultations or were members of the WHO expert advisory panels, and others identified through open calls for experts. In forming this group, the WHO Secretariat took into consideration the need for a balanced gender mix, expertise from multiple disciplinary areas and representation from all WHO regions. Efforts were made to include subject-matter experts (e.g. in nutrition, epidemiology, paediatrics and physiology); experts in systematic review, programme evaluation and Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodologies; and representatives of potential stakeholders (e.g. programme managers, policy advisers and other health professionals involved in the health-care process). Representatives of commercial organizations were not invited to participate because the inclusion of such individuals is considered to be inappropriate for membership of any WHO guideline group because of actual, potential and perceived conflicts of interest. External resource persons – including subject-matter experts and systematic review and GRADE methodologists – were invited to the NUGAG meetings as observers to provide technical input and to present systematic reviews. These individuals did not participate in the decision-making processes. NUGAG's role was to advise WHO on the choice of outcomes important for decision-making, and on interpretation of the evidence for the development of recommendations.

External peer-review group

The WHO Secretariat selected, as external peer reviewers, representatives of public institutions that are members of the WHO Global Network of Institutions for Scientific Advice on Nutrition,[1] subject-matter experts (including those in dentistry) and other stakeholders (including practitioners and editors of scientific journals). As with the

[1] NHD established the WHO Global Network of Institutions for Scientific Advice on Nutrition in 2010 to bring together the main public institutions that set guidelines for diet- and nutrition-related guidelines and guidance for their national governments, thus creating synergy and avoiding duplication of efforts *(36)*.

selection process for the guideline development group, this external peer-review group was selected taking into account the need for geographical and gender balance, to provide diverse and representative perspectives. The external peer-review group was asked to review the draft guideline to identify any errors or missing information before finalization of the guideline. The external peer reviewers who provided comments on the draft guideline are listed in Annex 5.

Public consultation

A public consultation was held during the planning stages of guideline development. The consultation called for comments on the scope of the guideline and on the specific research questions to be addressed and outcomes to be investigated in the systematic literature reviews. A call for comments was also posted on the NHD website, and disseminated through the electronic mailing lists of NHD (>4000 addressees) and of the United Nations (UN) Standing Committee on Nutrition (also >4000 addressees).

Through this public consultation, 16 comments were received from various stakeholders, including representatives of government agencies, academic institutions, nongovernmental organizations (NGOs) and food industries. The comments were reviewed and assessed by the WHO Secretariat, and then presented for review – along with the WHO Secretariat's assessment – to the NUGAG Subgroup on Diet and Health.

Through a similar process, a public consultation was held to call for comments on the draft guideline before its finalization. A total of 173 comments were received, from representatives of 24 government agencies, two UN agencies, 52 NGOs, 54 industry organizations and associations, 31 academic institutions and 10 other interested individuals. These comments were also reviewed by the WHO Secretariat, and were assessed and considered when finalizing the guideline.

A list of people who submitted comments in response to the public consultations, summaries of their comments and the assessment of the received comments by the WHO Secretariat are available on the NHD website.[1]

[1] http://www.who.int/nutrition/topics/advisory_group/nugag_dietandhealth/en/

Scoping of the guideline, evidence appraisal and decision-making

WHO developed an initial set of questions to be addressed in the guideline. The questions were based on the needs of Member States and international partners for policy and programme guidance. The population, intervention, comparison and outcome (PICO) format was used in generating the questions (Annex 6). The PICO questions were first discussed and reviewed by the WHO Secretariat and the WHO Steering Committee for Nutrition Guideline Development, and were then made available for public comment in February 2010. Feedback was received from a total of 16 individuals and organizational stakeholders, and the questions were adapted as necessary.

The draft set of PICO questions was presented to the NUGAG Subgroup on Diet and Health during its first meeting on 22–25 February 2010. During that meeting, the guideline topic was introduced, the scope of the guideline and the PICO questions were discussed, and outcomes and populations were ranked in importance by NUGAG members. The prioritization of the PICO questions defined the scope of the evidence to be used in informing development of the guideline. Subsequent to the meeting, WHO commissioned several systematic reviews and meta-analyses to address the PICO questions.

During the NUGAG meeting in February 2010, the anticipated difficulties in identifying sufficient data on weight gain, especially from developing countries, were discussed. To address this potential limitation, a number of NUGAG members from developing countries offered to share available country data. Additionally, to achieve systematic collection of "best available data and evidence" from developing countries, in August 2010 WHO sent out a call for data to all countries, through the WHO regional offices. Identified data were then reviewed and evaluated to determine whether they could be included in the review and analysis; no data met the inclusion criteria described in the PICO questions in Annex 6.

A follow-up meeting of the NUGAG Subgroup on Diet and Health was held on 14–17 March 2011, at which preliminary outcomes of the systematic reviews were discussed. At this follow-up meeting, NUGAG members requested further analyses, including the preparation of GRADE evidence profiles, which had not previously been included in the reviews. The NUGAG Subgroup on Diet and Health continued to review and discuss the evidence presented, and the GRADE assessment of the quality of evidence, at their subsequent meetings (held on 29 November – 2 December 2011, 27–30 March 2012 and 4–7 March 2013), and finalized the draft recommendations through consensus.

The systematic reviews and the GRADE evidence profiles for each of the critical outcomes were used for drafting the recommendations. When determining the strength of each recommendation, the NUGAG members considered various factors, including the overall quality of the evidence, the desirable and undesirable effects of the recommendation, values and preferences related to the recommendation in different settings, and the feasibility and cost of the options available to public health authorities in implementing the recommendation in different settings. These findings are summarized in Annex 7. The classification was discussed among the NUGAG members, the invited external resource persons and the members of the WHO Secretariat present at the meeting. The final wording of the recommendations and their strength were based on the consensus of members of the WHO Secretariat present and the NUGAG members only. There were no strong disagreements among the NUGAG members on any aspect of the guideline.

Management of conflicts of interest

According to the rules in the WHO *Basic documents (37)*, all experts participating in WHO meetings must declare any interest relevant to the meeting before participating. Declaration of interest forms were reviewed by the WHO Secretariat in consultation with the WHO Legal Office when finalizing the composition of the NUGAG Subgroup on Diet and Health. In addition, each participant verbally declared his or her interests at the start of each meeting. The procedures for management of interests outlined in the WHO *Guidelines for declaration of interests for WHO experts (38)* were strictly followed. The potential interests declared by members of the NUGAG Subgroup on Diet and Health and experts who participated in NUGAG meetings as external resource persons are summarized in Annex 8.

Similarly, declaration of interest forms from external peer reviewers were assessed by the WHO Secretariat, and the summaries of those declared interests are also provided in Annex 8.

People who submitted comments in response to the public consultation were also asked to fill in the declaration of interest forms, so that the nature of their interests could be understood when reviewing and assessing their comments.

Summary of evidence

Two systematic reviews were commissioned[1, 2] to assess the effects of increasing or decreasing intake of free sugars on excess weight gain and dental caries – two health outcomes identified as critical in relation to free sugars intake. Initially, several other outcomes, such as diabetes and cardiovascular disease (CVD), were also considered by the NUGAG Subgroup on Diet and Health. However, after extensive discussions, it was decided that excess weight gain and dental caries should be the key outcomes of concern in relation to free sugars intake. Risk of developing type 2 diabetes and CVD is often mediated through the effects of overweight and obesity, among other risk factors. Therefore, measures aimed at reducing overweight and obesity are likely to also reduce the risk of developing type 2 diabetes and CVD, and the complications associated with those diseases.

The specific research questions guiding the systematic reviews undertaken were:

- What is the effect of a decrease or increase in free sugars intake in adults and children?
- What is the effect of restricting intake of free sugars to below 10% of total energy?[3]

Body weight

The systematic review on body weight *(39)* examined the effects of free sugars intake on excess adiposity; that is, whether reducing or increasing the intake of free sugars influences measures of body weight in adults and children, and whether current evidence provides support for the existing recommendation to reduce intake of free sugars to less than 10% of total energy intake. Body weight was selected as an outcome, in view of the extent to which comorbidities of obesity contribute to the global burden of NCDs. Studies that included interventions involving advice to decrease or increase intake of free sugars, or sugar-containing foods or beverages, without emphasizing the need to achieve weight loss, were included in the review. In addition, evidence for differences between higher and lower free sugars intake was assessed from randomized controlled trials (RCTs) in which free sugars intake was altered but total energy intake was strictly controlled (i.e. isoenergetic). Trials that were specifically designed to achieve weight loss were excluded. It was acknowledged that the studies identified by this approach would inevitably be heterogeneous, that it would be difficult to disentangle the effects of a number of different dietary changes that might occur as a consequence of altering intake of free sugars, and that it might be difficult to identify a continuous relationship (dose–response) between intake of free sugars and body weight.

[1] A systematic review on free sugars intake and body weight was originally commissioned from the research team at the WHO Collaborating Centre at Durham University in the United Kingdom of Great Britain and Northern Ireland (UK) headed by Professor Carolyn Summerbell, because this team has conducted various systematic reviews on obesity-related issues including several Cochrane reviews. Due to unforeseen circumstances, responsibility for the review was then transferred to the WHO Collaborating Centre at the University of Otago in New Zealand and the review was led by Dr Lisa Te Morenga, a faculty member at the University.

[2] A systematic review on dental caries was commissioned from the research team at the WHO Collaborating Centre at Newcastle University in the UK, headed by Professor Paula Moynihan.

[3] Less than 10% of total energy intake is the existing population nutrient intake goal for free sugars *(3)*.

The systematic review of the effect of intake of free sugars on body weight included 30 of the 7895 RCTs and 38 of the 9445 cohort studies initially identified as meeting the inclusion criteria. Meta-analysis of the five trials in adults with ad libitum diets (i.e. no strict control on food intake) found that reduced intake of free sugars was associated with a decrease in body weight (–0.80 kg; 95% confidence interval [CI]: –1.21, –0.39). Meta-analysis of the 10 trials that involved increasing sugars intake (mostly sugar-sweetened beverages) suggested a comparable weight increase (0.75 kg; 95% CI: 0.30, 1.19). Meta-analysis of the 11 trials that examined isoenergetic exchanges of free sugars with other carbohydrates showed no change in body weight (0.04 kg; 95% CI: –0.04, 0.13).

The review identified five trials in children in which the intervention involved recommendations to reduce sugar-sweetened foods and beverages, but these trials were characterized by generally low compliance with dietary advice, and showed no overall change in body weight as measured by standardized body mass index (BMI) or BMI z score (0.09; 95% CI: –0.14, 0.32). However, meta-analysis of five prospective cohort studies, with follow-up times of 1 year or more, found that those children with the highest intakes of sugar-sweetened beverages had a greater likelihood of being overweight or obese than those children with the lowest intakes (odds ratio [OR] 1.55; 95% CI: 1.32, 1.82). Significant heterogeneity was evident in one of the meta-analyses, and some trials were subject to potential bias that could have influenced the findings; nevertheless, sensitivity analyses showed that the trends were consistent and associations remained, even when excluding data from the potentially biased studies and studies contributing most to the observed heterogeneity.

The overall quality of the available evidence for changes in body weight in relation to both increasing and decreasing free sugars intake in adults was considered to be moderate; this was due to downgrading for possible biases identified in a minority of studies and potential publication bias because of the small number of trials identified (Annex 1). In children, the quality of evidence for an association between a reduction in free sugars intake and reduced body weight was similarly considered to be moderate, whereas the quality of the evidence for an association between an increase in free sugars intake and increased body weight was considered to be low (Annex 1).

Dental caries

The systematic review on dental caries addressed the relationship between the level of free sugars intake and dental caries in adults and children *(40)*. A literature search for studies conducted in adults identified two non-randomized intervention trials and two observational studies (cross-sectional studies) that met the inclusion criteria. In addition, one ecological study conducted in both adults and children was identified. No RCTs or longitudinal cohort studies were identified that met the inclusion criteria. The studies included about 1200 participants in total, and all studies in adults were conducted in industrialized countries.

A literature search for studies conducted in children identified one non-randomized intervention study and 50 observational studies that met the inclusion criteria. The observational studies included eight longitudinal cohort studies, 20

ecological studies (including one with both adults and children) and 22 cross-sectional studies. No RCTs were identified that met the inclusion criteria. Without including estimates on sample or population size from the population or ecological studies, the studies included more than 260 000 participants.

Among the 47 studies that reported at least one positive association between sugars intake and dental caries, 42 were conducted in children, four in adults and one in a mixed population of both adults and children. Six studies reported both positive and null findings, depending on the age or ethnic group of the participants; seven studies reported null findings in all measured associations; and two studies reported at least one negative association. Positive associations between free sugars intake and dental caries were detected in all ages (including <5 years to >65 years); in developing, transitional and industrialized countries; and in all decades of publication of results. Overall, the evidence suggests a positive association between amount of free sugars intake and dental caries in both children and adults.

The overall quality of the evidence pertaining to dental caries was generated from the eight cohort studies analysed (Annex 1). None of the studies were excluded on the basis of quality. Seven of the eight studies reported higher dental caries with higher sugars intake. Six of the eight studies accounted for fluoride exposure. For the analysis relating to dental caries in adults, data were not downgraded for indirectness, although all cohort studies were conducted in children. The etiology of dental caries is the same in children and adults and, because dental caries tracks from childhood to adulthood, the negative health effects of dental caries are cumulative. Five of the eight cohort studies enabled the comparison of dental caries development when free sugars intake was equivalent to an amount less than 10% of total energy intake or more than 10% of total energy intake. All of these studies reported higher levels of dental caries when the amount of free sugars intake was more than 10% of total energy intake compared with it being less than 10% of total energy intake.

The data extracted from the cohort studies was not suitable for pooling and subsequent meta-analysis because of the high degree of variability in how the data were reported. This variability included differences in selection and reporting of outcomes, study populations, types of interventions, how sugars intake and caries were measured and analyses were performed, the types of sugars reported on, and the availability of information on level of fluoride exposure. Overall effect and quality of evidence for free sugars intake and dental caries was determined based on qualitative analysis of all relevant cohort studies.

Three national population studies were identified that enabled comparison of dental caries levels when annual per capita free sugars intake was less than 10 kg/person/year (about 5% of total energy intake), compared with more than 10 kg/person/year but below 18.25 kg/person/year (about 10% of total energy intake). In all three studies, lower levels of dental caries development were observed when per capita free sugars intake was less than 10 kg/person/year. Across all studies, a log-linear dose–response relationship was also observed at free sugars intakes well below 10 kg/person/year (i.e. <5% of total energy intake).

All three population studies were conducted in Japan on children with low fluoride exposure. However, dental caries persists in fluoridated populations, especially in adults *(41, 42)*; therefore, all populations, irrespective of fluoride exposure, could potentially benefit from a low level of free sugars intake to protect against dental caries.

For the systematic review on dental caries, in most studies identified, dental caries was diagnosed at the level of cavitation (i.e. advanced stage).[1] However, the pathological process of dental caries begins with pre-cavitation damage *(43, 44)*, which may occur at amounts of sugars intake below that associated with limited or no cavities. The negative health effects of dental caries are cumulative because the disease is the result of lifelong exposure to the dietary risk factor (i.e. free sugars). Being free of cavities in childhood does not mean being caries-free for life, and most dental caries is now occurring in adults *(41, 45-47)*. Therefore, even a small reduction in risk of dental caries in childhood is of significance in later life.

[1] Some modern dental surveys in industrialized countries use dental caries scoring systems such as the International Caries Detection and Assessment System (ICDAS) (https://www.icdas.org/), which is an integrated system for measuring dental caries that diagnoses the disease at both the pre-cavitation stage and the cavitation stage.

Recommendations and remarks

Recommendations

- WHO recommends a reduced intake of free sugars throughout the lifecourse (*strong recommendation*[1]).
- In both adults and children, WHO recommends reducing the intake of free sugars to less than 10% of total energy intake[2] (*strong recommendation*).
- WHO suggests a further reduction of the intake of free sugars to below 5% of total energy intake (*conditional recommendation*[3]).

Remarks

- Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.
- For countries with a low intake of free sugars, levels should not be increased. Higher intakes of free sugars threaten the nutrient quality of diets by providing significant energy without specific nutrients *(3)*.
- These recommendations were based on the totality of evidence reviewed regarding the relationship between free sugars intake and body weight (low and moderate quality evidence) and dental caries (very low and moderate quality evidence).
- Increasing or decreasing free sugars is associated with parallel changes in body weight, and the relationship is present regardless of the level of intake of free sugars. The excess body weight associated with free sugars intake results from excess energy intake.
- The recommendation to limit free sugars intake to less than 10% of total energy intake is based on moderate quality evidence from observational studies of dental caries.
- The recommendation to further limit free sugars intake to less than 5% of total energy intake is based on very low quality evidence from ecological studies in which a positive dose–response relationship between free sugars intake and dental caries was observed at free sugars intake of less than 5% of total energy intake.

[1] **Strong recommendations** indicate that "the desirable effects of adherence to the recommendation outweigh the undesirable consequences" *(20)*. This means that "the recommendation can be adopted as policy in most situations" *(20)*.

[2] Total energy intake is the sum of all daily calories/kilojoules consumed from food and drink. Energy comes from macronutrients, such as fat (9 kcal/37.7 kJ per gram), carbohydrate (4 kcal/16.7 kJ per gram) including total sugars (free sugars + intrinsic sugars + milk sugars) and dietary fibre, protein (4 kcal/16.7 kJ per gram) and ethanol (i.e. alcohol) (7 kcal/29.3 kJ per gram). Total energy intake is calculated by multiplying these energy factors by the number of grams of each type of food and drink consumed and then adding all values together. A percentage of total energy intake is therefore a percentage of total calories/kilojoules consumed per day.

[3] **Conditional recommendations** are made when there is less certainty "about the balance between the benefits and harms or disadvantages of implementing a recommendation" *(20)*. This means that "policy-making will require substantial debate and involvement of various stakeholders" *(20)* for translating them into action.

- The recommendation to further limit free sugars intake to less than 5% of total energy intake, which is also supported by other recent analyses *(15, 16)*, is based on the recognition that the negative health effects of dental caries are cumulative, tracking from childhood to adulthood *(21, 22)*. Because dental caries is the result of lifelong exposure to a dietary risk factor (i.e. free sugars), even a small reduction in the risk of dental caries in childhood is of significance in later life; therefore, to minimize lifelong risk of dental caries, the free sugars intake should be as low as possible.
- No evidence for harm associated with reducing the intake of free sugars to less than 5% of total energy intake was identified.
- Although exposure to fluoride reduces dental caries at a given age, and delays the onset of the cavitation process, it does not completely prevent dental caries, and dental caries still progresses in populations exposed to fluoride *(23-35)*.
- Intake of free sugars is not considered an appropriate strategy for increasing caloric intake in individuals with inadequate energy intake if other options are available.
- These recommendations do not apply to individuals in need of therapeutic diets, including for the management of severe and moderate acute malnutrition. Specific guidelines for management of severe and moderate acute malnutrition are being developed separately.

EXHIBIT B

Chapter 7.72
SUGAR-SWEETENED BEVERAGE PRODUCT DISTRIBUTION TAX

Sections:

Code reviser's note: Section 4 of Ord. 7388-NS provides, "This Ordinance shall be effective on January 1, 2015. The last effective date of this Ordinance shall be December 31, 2026, and it shall terminate as of January 1, 2027."

7.72.010 Excise tax.

A. In addition to any other taxes imposed by the City, the City hereby levies a tax of one cent ($0.01) per fluid ounce on the privilege of Distributing Sugar-sweetened beverage products in the City.

B. For the purposes of this Chapter, the volume, in ounces, of a Sugar-sweetened beverage product shall be calculated as follows:

1. For a Sugar-sweetened beverage, the volume, in fluid ounces, of Sugar-sweetened beverages distributed to any person in the course of business in the City.

2. For Added caloric sweeteners, the largest volume, in fluid ounces, of Sugar-sweetened beverages that could be produced from the Added caloric sweeteners. In accordance with rules and regulations promulgated by the City pursuant to Section 7.72.040, the largest volume, in fluid ounces, that would typically be produced from the Added caloric sweeteners shall be determined based on the manufacturer's instructions or, if the Distributor uses the Added caloric sweeteners to produce a Sugar-sweetened beverage, the regular practice of the Distributor.

C. The tax shall be paid upon the first nonexempt Distribution of a Sugar-sweetened beverage product in the City. To the extent that there is a chain of Distribution within Berkeley involving more than one Distributor, the tax shall be levied on the first Distributor subject to the jurisdiction of the City. To the extent the tax is not paid as set forth above for any reason, it shall be payable on subsequent Distributions and by subsequent Distributors; provided, that the Distribution of Sugar-sweetened beverage products may not be taxed more than once in the chain of commerce. (Ord. 7388-NS § 3 (part), 2014)

7.72.020 Exemptions.

The tax imposed by this Chapter shall not apply:

A. To any Distributor that is not subject to taxation by the City under the laws of the United States or the State of California;

B. To any Distribution of a Sugar-sweetened beverage product to a Retailer with less than $100,000 in annual gross receipts, as defined in Section 9.04.025, in the most recent year;

C. To any Distribution of Natural or common sweeteners; or

D. To any Distribution of Added caloric sweeteners to a Food Products Store as defined in Section 23F.04.010, if the Food Products Store then offers the Added caloric sweetener for sale for later use by customers of that store. (Ord. 7388-NS § 3 (part), 2014)

7.72.030 Definitions.

A. "Added caloric sweetener" means any substance or combination of substances that meets all of the following four criteria:

1. Is suitable for human consumption;

2. Adds calories to the diet if consumed;

3. Is perceived as sweet when consumed; and

4. Is used for making, mixing, or compounding Sugar-sweetened beverages by combining the substance or substances with one or more other ingredients including, without limitation, water, ice, powder, coffee, tea, fruit juice, vegetable juice, or carbonation or other gas.

An Added caloric sweetener may take any form, including but not limited to a liquid, syrup, and powder, whether or not frozen. "Added caloric sweetener" includes, without limitation, sucrose, fructose, glucose, other sugars, and high fructose corn syrup, but does not

include a substance that exclusively contains natural, concentrated, or reconstituted fruit or vegetable juice or any combination thereof.

B. "Alcoholic beverage" means any beverage subject to tax under Part 14 (commencing with Section 32001) of the California Revenue and Taxation Code, as that Part may be amended from time to time.

C. "Beverage for medical use" means a beverage suitable for human consumption and manufactured for use as an oral nutritional therapy for persons who cannot absorb or metabolize dietary nutrients from food or beverages, or for use as an oral rehydration electrolyte solution for infants and children formulated to prevent or treat dehydration due to illness. "Beverage for medical use" shall also mean a "medical food" as defined in Section 109971 of the California Health and Safety Code, as that definition may be amended from time to time. "Beverage for medical use" shall not include drinks commonly referred to as "sports drinks" or any other common names that are derivations thereof.

D. "Business Entity" means any Person except for a natural person.

E. "City" means the City of Berkeley, California.

F. "City Manager" means the City Manager of the City of Berkeley or his or her designee.

G. "Consumer" means a natural person who purchases a Sugar-sweetened beverage product in the City for a purpose other than resale in the ordinary course of business.

H. "Distribution" or "Distribute" means the transfer of title or possession (1) from one Business entity to another for consideration or (2) within a single Business entity, such as by a wholesale or warehousing unit to a retail outlet or between two or more employees or contractors. "Distribution" or "Distribute" shall not mean the retail sale to a Consumer.

I. "Distributor" means any Person who Distributes Sugar-sweetened beverage products in the City.

J. "Milk" means natural liquid milk, regardless of animal source or butterfat content, natural milk concentrate, whether or not reconstituted, regardless of animal source or butterfat content, or dehydrated natural milk, whether or not reconstituted and regardless of animal source or butterfat content, and plant-based milk substitutes, that are marketed as milk, such as soy milk and almond milk.

K. "Natural or common sweetener" means granulated white sugar, brown sugar, honey, molasses, xylem sap of maple trees, or agave nectar.

L. "Person" means an individual, trust, firm, joint stock company, business concern, business trust, government, receiver, trustee, syndicate, social club, fraternal organization, estate, corporation, including, but not limited to, a limited liability company, and association or any other group or combination acting as a unit.

M. "Retailer" means any Person who serves Sugar-sweetened beverage products to a Consumer.

N. "Simple syrup" means a mixture of water and one or more Natural or common sweeteners without any additional ingredients.

O. "Sugar-sweetened beverage" means any beverage intended for human consumption to which one or more Added caloric sweeteners has been added and that contains at least 2 calories per fluid ounce.

1. "Sugar-sweetened beverage" includes, but is not limited to all drinks and beverages commonly referred to as "soda," "pop," "cola," "soft drinks," "sports drinks," "energy drinks," "sweetened ice teas," or any other common names that are derivations thereof.

2. "Sugar-sweetened beverage" shall not include any of the following:

a. Any beverage in which milk is the primary ingredient, i.e., the ingredient constituting a greater volume of the product than any other;

b. Any beverage for medical use;

c. Any liquid sold for use for weight reduction as a meal replacement;

d. Any product commonly referred to as "infant formula" or "baby formula"; or

e. Any alcoholic beverage.

P. "Sugar-sweetened beverage product" means a Sugar-sweetened beverage or Added caloric sweetener. (Ord. 7388-NS § 3 (part), 2014)

7.72.040 Duties, responsibilities and authority of the City Manager.

A. It shall be the duty of the City Manager to collect and receive all taxes imposed by this Chapter, and to keep an accurate record thereof.

B. The City Manager is hereby charged with the enforcement of this Chapter, except as otherwise provided herein, and may prescribe, adopt, and enforce rules and regulations relating to the administration and enforcement of this Chapter, including provisions for the

reexamination and correction of returns and payments, and for reporting. Such rules and regulations may include, but are not limited to, the following:

1. The determination of the frequency with which a Distributor must calculate the tax. This determination shall not constitute an increase of the tax.

2. The determination of the frequency with which a Distributor must pay the tax. This determination shall not constitute an increase of the tax.

3. The determination of whether and how a Distributor must register with the City.

4. The determination of whether and how a Distributor who receives, in the City, Sugar-sweetened beverage products from another Distributor must report to the City the name of that Distributor.

5. The determination of whether and how a Distributor who receives, in the City, Sugar-sweetened beverage products from another distributor must report to the City the volume of Sugar-sweetened beverage products received from that Distributor.

6. The determination of what other documentation is required to be created or maintained by a Distributor.

C. The City Manager shall annually verify that the taxes owed under this Chapter have been properly applied, exempted, collected, and remitted. (Ord. 7388-NS § 3 (part), 2014)

7.72.050 Collection.

A. The amount of any tax, penalty, and interest imposed under the provisions of this Chapter shall be deemed a debt to the City. Any Distributor owing money under the provisions of this Chapter shall be liable in an action brought in the name of the City for the recovery of such amount.

B. In order to aid in the City's collection of taxes due under this Chapter, any Retailer that receives Sugar-sweetened beverage products from a Distributor shall, in accordance with rules and regulations promulgated by the City Manager pursuant to Section 7.72.040, either:

1. report to the City all such transactions, the volume in ounces of Sugar-sweetened beverage products received in each transaction, and the identity and contact information of the Distributor from whom the Sugar-sweetened beverage products were received; or

2. collect the tax that would be payable as a result of the transaction by the Distributor from whom the Sugar-sweetened beverage product was received and remit it to the City; or

3. provide to the City evidence that the Distributor from whom the Sugar-sweetened beverage products were received has registered as a Distributor with the City and that registration is current.

C. The City Council is authorized to have the taxes imposed by this Chapter collected by the County of Alameda or the California Board of Equalization in conjunction with the collection of other taxes for the City. If the City Council exercises this authorization, the duties and responsibilities of the City Manager shall be given, as appropriate, to the County of Alameda or the California Board of Equalization, which may delegate such duties and responsibilities as necessary and as authorized by law. (Ord. 7388-NS § 3 (part), 2014)

7.72.060 Refunds.

Whenever any tax under this Chapter has been paid more than once or has been erroneously or illegally collected or received by the City, it may be refunded only as provided in Chapter 7.20 of the Berkeley Municipal Code. (Ord. 7388-NS § 3 (part), 2014)

7.72.070 Enforcement.

Except as otherwise provided by this Chapter or by rule or regulation promulgated by the City Manager, the tax imposed by this Chapter shall be administered in the same manner as taxes imposed pursuant to Chapter 9.04 and, without limitation, shall be subject to the same delinquency penalties, appeals processes and other enforcement provisions set forth in Chapter 9.04. (Ord. 7388-NS § 3 (part), 2014)

7.72.080 Not a sales and use tax.

The tax imposed by this Chapter is a tax upon the privilege of conducting business, specifically, Distributing Sugar sweetened beverage products within the City of Berkeley. It is not a sales, use, or other excise tax on the sale, consumption or use of Sugar-sweetened beverage products. (Ord. 7388-NS § 3 (part), 2014)

7.72.090 Sugar-Sweetened Beverage Product Panel of Experts.

A. There shall be established the Sugar-Sweetened Beverage Product Panel of Experts to make recommendations on how and to what extent the City should establish and/or fund programs to reduce the consumption of sugar-sweetened beverages in Berkeley and to address the effects of such consumption.

B. An officer or employee of the City designated by the City Manager shall serve as secretary of the Panel.

C. In accordance with Chapter 2.04, the Panel shall be composed of nine members appointed by the City Council.

D. Terms shall expire and vacancies shall be filled in accordance with the provisions of Section 2.04.030 through 2.04.145 of this Code.

E. Each member of the Panel must:

1. Have experience in community-based youth food and nutrition programs; or

2. Have experience in school-based food and nutrition programs and be referred by the Berkeley Unified School District; or

3. Have experience in early childhood nutrition education; or

4. Have experience in researching public health issues or evaluating public health programs related to diabetes, obesity, and sugary drink consumption; or

5. Be a licensed medical practitioner.

F. In accordance with Section 3.02.040, members of the Panel may be reappointed but shall not serve more than eight consecutive years.

G. The Panel shall, by majority vote, do each of the following:

1. Annually appoint one of its members as chair and one of its members as vice-chair;

2. Approve bylaws to facilitate the proper functioning of the Panel;

3. Establish a regular time and place of meeting. All meetings shall be noticed as required by law and shall be scheduled in a way to allow for maximum input from the public. Minutes for each meeting shall be recorded, kept, and maintained; and

4. Publish an annual report that includes the following:

a. recommendations on how to allocate the City's general funds to reduce the consumption of sugar sweetened beverages in Berkeley and to address the results of such consumption;

b. information, if available, concerning the impact of this Chapter on the public health of the residents of the City; and

c. any additional information that the Panel deems appropriate.

H. Within 15 days of receipt of the publication of the Panel's annual report, the City Manager shall cause the report to be published on the City's Internet website and to be transmitted to the City Council and the Governing Board of the Berkeley Unified School District.

I. The City Council shall consider, but need not follow, the Panel's recommendations and shall annually inform the Panel as to the extent to which it has implemented the Panel's recommendations. (Ord. 7388-NS § 3 (part), 2014)

7.72.100 Increase appropriations limits.

Pursuant to California Constitution article XIIIB, the appropriation limit for the City is increased by the aggregate sum authorized to be levied by this tax for each of the four fiscal years from 2015-16 through 2018-19. (Ord. 7388-NS § 3 (part), 2014)

7.72.110 Amendment.

The City Council, without a vote of the people, may, either permanently or temporarily, increase the dollar amount of the threshold for the small-business exemption in Section 7.72.020.B. (Ord. 7388-NS § 3 (part), 2014)

EXHIBIT C

ORDINANCE NO. 7,388–N.S.

IMPOSING A GENERAL TAX ON THE DISTRIBUTION OF SUGAR-SWEETENED BEVERAGE PRODUCTS

BE IT ORDAINED by the People of the City of Berkeley as follows:

Section 1. Findings

A. Our nation, our state, and our community face a major public health crisis.
B. Diabetes, obesity, and tooth decay have been on the rise for decades. Although no group has escaped these epidemics, children as well as low income communities and communities of color have been and continue to be disproportionately affected.
C. While there is no single cause for the rise in diabetes, obesity, and tooth decay, there is overwhelming evidence of the link between the consumption of sugary drinks and the incidence of diabetes, obesity, and tooth decay.
D. Sugary drinks such as soft drinks, energy drinks, sweetened teas, and sport drinks offer little or no nutritional value, but massive quantities of added sugar. A single 20-ounce bottle of soda, for instance, typically contains the equivalent of approximately 16 teaspoons of sugar.
E. Before the 1950s, the standard soft-drink bottle was 6.5 ounces. In the 1950s, larger size containers were introduced, including the 12-ounce can, which became widely available in 1960. By the early 1990s, 20-ounce plastic bottles had become the norm.
F. At the same time, hundreds of millions of dollars have been spent in an ongoing massive marketing campaign, which particularly targets children and people of color. In 2006 alone, nearly $600 million was spent in advertising to children under 18. African American and Latino children are also aggressively targeted with advertisements to promote sugar-laden drinks.
G. The resulting impact on consumption should not be surprising. The average American now drinks nearly 50 gallons of sugary drinks a year. The problem is especially acute with children in California. From 1989 to 2008, the percentage of children consuming sugary drinks increased from 79% to 91% and the percentage of total calories obtained from sugary drinks increased by 60% in children ages 6 to 11.
H. This level of consumption has had tragic impacts on community health. Type 2 Diabetes – previously only seen among adults – is now increasing among children. If the current obesity trends are not reversed, it is predicted that one in three children and *nearly one-half* of Latino and African American children born in the year 2000 will develop type 2 diabetes in their lifetimes.
I. An Asian resident of Berkeley is almost 3 times more likely than a white resident to have been diagnosed with diabetes, and an African American resident of Berkeley is 14 times more likely than a white resident to be hospitalized for diabetes.
K. Childhood obesity has more than doubled in children and tripled in adolescents in the past 30 years; in 2010, more than one-third of children and adolescents were overweight or obese.
N. Our community has not been immune to the challenge of unhealthy weight gain and obesity. In 2008-09, over 40% of Berkeley 9th graders were overweight or obese. These overweight and obese children have a much greater chance of being obese as adults, with all the health risks that entails.

M. There are also economic costs. In 2006, for instance, overweight and obesity-related costs in California were estimated at almost $21 billion.
O. Tooth decay, while not as life threatening as diabetes or obesity, still has a meaningful impact, especially on children. In fact, tooth decay is the most common childhood disease, experienced by over 70% of California's 3rd graders. Children who frequently or excessively consume beverages high in sugar are at increased risk for dental cavities. Dental problems are a major cause of missed school days and poor school performance as well as pain, infection, and tooth loss in California.

Section 2. Purpose and Intent

A. Based on the findings set forth above, the purpose of this Ordinance is to diminish the human and economic costs of diseases associated with the consumption of sugary drinks by discouraging their distribution and consumption in Berkeley through a tax. Specifically, the purpose of this ordinance is to tax the distribution of sugary drinks and the products used to make them.
B. This Ordinance is not intended for the purpose of regulation.
C. This Ordinance does not authorize the conduct of any business or activity in the city, but merely provides for the taxation of distribution of specified products as it occurs.
D. This Ordinance imposes a general tax on the distribution of sugar-sweetened beverages such as high-calorie, low-nutrition products, like soda, energy drinks, and heavily presweetened tea, as well as the added caloric sweeteners used to produce these sugar-sweetened beverages, such as the premade syrup used to make fountain drinks. Certain drinks containing sugar are exempted, including infant formula, milk products, and natural fruit and vegetable juice.
E. This Ordinance provides for a small business exemption for Retailers who transport sugar-sweetened beverage products into the City themselves and then sell those products directly to consumers.
F. This general tax will provide revenue to be available for the general governmental needs of the people of Berkeley.
G. This Ordinance provides for a Sugar Sweetened Beverage Product Panel of Experts, composed of experts in the areas of public health, child nutrition, nutrition education, and food access programs. The Panel will make recommendations on how and to what extent the City should fund programs to further reduce the consumption of sugar-sweetened beverages in Berkeley and address the consequences of such consumption.

Section 3. New Berkeley Municipal Code Chapter 7.72

That a new Chapter 7.72 is added to the Berkeley Municipal Code is to read as follows:

Chapter 7.72
Sugar-Sweetened Beverage Product Distribution Tax

Section 7.72.010 Excise Tax

A. In addition to any other taxes imposed by the City, the City hereby levies a tax of one cent ($0.01) per fluid ounce on the privilege of Distributing Sugar-sweetened beverage products in the City.

B. For the purposes of this Chapter, the volume, in ounces, of a Sugar-sweetened beverage product shall be calculated as follows:
   1. For a Sugar-sweetened beverage, the volume, in fluid ounces, of Sugar-sweetened beverages distributed to any person in the course of business in the City.
   2. For Added caloric sweeteners, the largest volume, in fluid ounces, of Sugar-sweetened beverages that could be produced from the Added caloric sweeteners. In accordance with rules and regulations promulgated by the City pursuant to Section 7.72.040, the largest volume, in fluid ounces, that would typically be produced from the Added caloric sweeteners shall be determined based on the manufacturer's instructions or, if the Distributor uses the Added caloric sweeteners to produce a Sugar-sweetened beverage, the regular practice of the Distributor.

C. The tax shall be paid upon the first non-exempt Distribution of a Sugar-sweetened beverage product in the City. To the extent that there is a chain of Distribution within Berkeley involving more than one Distributor, the tax shall be levied on the first Distributor subject to the jurisdiction of the City. To the extent the tax is not paid as set forth above for any reason, it shall be payable on subsequent Distributions and by subsequent Distributors, provided that the Distribution of Sugar-sweetened beverage products may not be taxed more than once in the chain of commerce.

Section 7.72.020 Exemptions

The tax imposed by this Chapter shall not apply:

A. To any Distributor that is not subject to taxation by the City under the laws of the United States or the State of California;

B. To any Distribution of a Sugar-sweetened beverage product to a Retailer with less than $100,000 in annual gross receipts, as defined in Section 9.04.025, in the most recent year;

C. To any Distribution of Natural or common sweeteners; or

D. To any Distribution of Added caloric sweeteners to a Food Products Store as defined in Section 23F.04.010, if the Food Products Store then offers the Added caloric sweetener for sale for later use by customers of that store.

Section 7.72.030 Definitions

A. "Added caloric sweetener" means any substance or combination of substances that meets all of the following four criteria:
   1. Is suitable for human consumption;
   2. Adds calories to the diet if consumed;
   3. Is perceived as sweet when consumed; and
   4. Is used for making, mixing, or compounding Sugar-sweetened beverages by combining the substance or substances with one or more other ingredients including, without limitation, water, ice, powder, coffee, tea, fruit juice, vegetable juice, or carbonation or other gas.

   An Added caloric sweetener may take any form, including but not limited to a liquid, syrup, and powder, whether or not frozen. "Added caloric sweetener" includes, without limitation, sucrose, fructose, glucose, other sugars, and high fructose corn syrup, but does not include a substance that exclusively contains natural, concentrated, or reconstituted fruit or vegetable juice or any combination thereof.

B. "Alcoholic beverage" means any beverage subject to tax under Part 14 (commencing with Section 32001) of the California Revenue and Taxation Code, as that Part may be amended from time to time.
C. "Beverage for medical use" means a beverage suitable for human consumption and manufactured for use as an oral nutritional therapy for persons who cannot absorb or metabolize dietary nutrients from food or beverages, or for use as an oral rehydration electrolyte solution for infants and children formulated to prevent or treat dehydration due to illness. "Beverage for medical use" shall also mean a "medical food" as defined in Section 109971 of the California Health and Safety Code, as that definition may be amended from time to time. "Beverage for medical use" shall not include drinks commonly referred to as "sports drinks" or any other common names that are derivations thereof.
D. "Business Entity" means any Person except for a natural person.
E. "City" means the City of Berkeley, California.
F. "City Manager" means the City Manager of the City of Berkeley or his or her designee.
G. "Consumer" means a natural person who purchases a Sugar-sweetened beverage product in the City for a purpose other than resale in the ordinary course of business.
H. "Distribution" or "Distribute" means the transfer of title or possession (1) from one Business entity to another for consideration or (2) within a single Business entity, such as by a wholesale or warehousing unit to a retail outlet or between two or more employees or contractors. "Distribution" or "Distribute" shall not mean the retail sale to a Consumer.
I. "Distributor" means any Person who Distributes Sugar-sweetened beverage products in the City.
J. "Milk" means natural liquid milk, regardless of animal source or butterfat content, natural milk concentrate, whether or not reconstituted, regardless of animal source or butterfat content, or dehydrated natural milk, whether or not reconstituted and regardless of animal source or butterfat content, and plant-based milk substitutes, that are marketed as milk, such as soy milk and almond milk.
K. "Natural or common sweetener" means granulated white sugar, brown sugar, honey, molasses, xylem sap of maple trees, or agave nectar.
L. "Person" means an individual, trust, firm, joint stock company, business concern, business trust, government, receiver, trustee, syndicate, social club, fraternal organization, estate, corporation, including, but not limited to, a, limited liability company, and association or any other group or combination acting as a unit.
M. "Retailer" means any Person who serves Sugar-sweetened beverage products to a Consumer.
N. "Simple syrup" means a mixture of water and one or more Natural or common sweeteners without any additional ingredients.
O. "Sugar-sweetened beverage" means any beverage intended for human consumption to which one or more Added caloric sweeteners has been added and that contains at least 2 calories per fluid ounce.
    1. "Sugar-sweetened beverage" includes, but is not limited to all drinks and beverages commonly referred to as "soda," "pop," "cola," "soft drinks," "sports

drinks," "energy drinks," "sweetened ice teas," or any other common names that are derivations thereof.

2. "Sugar-sweetened beverage" shall not include any of the following:
   a. Any beverage in which milk is the primary ingredient, i.e., the ingredient constituting a greater volume of the product than any other;
   b. Any beverage for medical use;
   c. Any liquid sold for use for weight reduction as a meal replacement;
   d. Any product commonly referred to as "infant formula" or "baby formula"; or
   e. Any alcoholic beverage.

P. "Sugar-sweetened beverage product" means a Sugar-sweetened beverage or Added caloric sweetener.

Section 7.72.040 Duties, Responsibilities and Authority of the City Manager

A. It shall be the duty of the City Manager to collect and receive all taxes imposed by this Chapter, and to keep an accurate record thereof.

B. The City Manager is hereby charged with the enforcement of this Chapter, except as otherwise provided herein, and may prescribe, adopt, and enforce rules and regulations relating to the administration and enforcement of this Chapter, including provisions for the reexamination and correction of returns and payments, and for reporting. Such rules and regulations may include, but are not limited to, the following:
   1. The determination of the frequency with which a Distributor must calculate the tax. This determination shall not constitute an increase of the tax.
   2. The determination of the frequency with which a Distributor must pay the tax. This determination shall not constitute an increase of the tax.
   3. The determination of whether and how a Distributor must register with the City.
   4. The determination of whether and how a Distributor who receives, in the City, Sugar-sweetened beverage products from another Distributor must report to the City the name of that Distributor.
   5. The determination of whether and how a Distributor who receives, in the City, Sugar-sweetened beverage products from another distributor must report to the City the volume of Sugar-sweetened beverage products received from that Distributor.
   6. The determination of what other documentation is required to be created or maintained by a Distributor.

C. The City Manager shall annually verify that the taxes owed under this Chapter have been properly applied, exempted, collected, and remitted.

Section 7.72.050 Collection

A. The amount of any tax, penalty, and interest imposed under the provisions of this Chapter shall be deemed a debt to the City. Any Distributor owing money under the provisions of this Chapter shall be liable in an action brought in the name of the City for the recovery of such amount.

B. In order to aid in the City's collection of taxes due under this Chapter, any Retailer that receives Sugar-sweetened beverage products from a Distributor shall, in accordance with rules and regulations promulgated by the City Manager pursuant to Section 7.72.040, either:

1. report to the City all such transactions, the volume in ounces of Sugar-sweetened beverage products received in each transaction, and the identity and contact information of the Distributor from whom the Sugar-sweetened beverage products were received; or
2. collect the tax that would be payable as a result of the transaction by the Distributor from whom the Sugar-sweetened beverage product was received and remit it to the City; or
3. provide to the City evidence that the Distributor from whom the Sugar-sweetened beverage products were received has registered as a Distributor with the City and that registration is current.

C. The City Council is authorized to have the taxes imposed by this Chapter collected by the County of Alameda or the California Board of Equalization in conjunction with the collection of other taxes for the City. If the City Council exercises this authorization, the duties and responsibilities of the City Manager shall be given, as appropriate, to the County of Alameda or the California Board of Equalization, which may delegate such duties and responsibilities as necessary and as authorized by law.

Section 7.72.060 Refunds

Whenever any tax under this Chapter has been paid more than once or has been erroneously or illegally collected or received by the City, it may be refunded only as provided in Chapter 7.20 of the Berkeley Municipal Code.

Section 7.72.070 Enforcement

Except as otherwise provided by this Chapter or by rule or regulation promulgated by the City Manager, the tax imposed by this Chapter shall be administered in the same manner as taxes imposed pursuant to Chapter 9.04 and, without limitation, shall be subject to the same delinquency penalties, appeals processes and other enforcement provisions set forth in Chapter 9.04.

Section 7.72.080 Not a Sales and Use Tax

The tax imposed by this Chapter is a tax upon the privilege of conducting business, specifically, Distributing Sugar sweetened beverage products within the City of Berkeley. It is not a sales, use, or other excise tax on the sale, consumption or use of Sugar-sweetened beverage products.

Section 7.72.090 Sugar-Sweetened Beverage Product Panel of Experts

A. There shall be established the Sugar-Sweetened Beverage Product Panel of Experts to make recommendations on how and to what extent the City should establish and/or fund programs to reduce the consumption of sugar-sweetened beverages in Berkeley and to address the effects of such consumption.
B. An officer or employee of the City designated by the City Manager shall serve as secretary of the Panel.
C. In accordance with Chapter 2.04, the Panel shall be composed of nine members appointed by the City Council.
D. Terms shall expire and vacancies shall be filled in accordance with the provisions of Section 2.04.030 through 2.04.145 of this Code.
E. Each member of the Panel must:

1. Have experience in community-based youth food and nutrition programs; or
2. Have experience in school-based food and nutrition programs and be referred by the Berkeley Unified School District; or
3. Have experience in early childhood nutrition education; or
4. Have experience in researching public health issues or evaluating public health programs related to diabetes, obesity, and sugary drink consumption; or
5. Be a licensed medical practitioner.

F. In accordance with Section 3.02.040, members of the Panel may be reappointed but shall not serve more than eight consecutive years.

G. The Panel shall, by majority vote, do each of the following:
   1. Annually appoint one of its members as chair and one of its members as vice-chair;
   2. Approve bylaws to facilitate the proper functioning of the Panel;
   3. Establish a regular time and place of meeting. All meetings shall be noticed as required by law and shall be scheduled in a way to allow for maximum input from the public. Minutes for each meeting shall be recorded, kept, and maintained; and
   4. Publish an annual report that includes the following:
      a. recommendations on how to allocate the City's general funds to reduce the consumption of sugar sweetened beverages in Berkeley and to address the results of such consumption;
      b. information, if available, concerning the impact of this Chapter on the public health of the residents of the City; and
      c. any additional information that the Panel deems appropriate.

H. Within 15 days of receipt of the publication of the Panel's annual report, the City Manager shall cause the report to be published on the City's Internet website and to be transmitted to the City Council and the Governing Board of the Berkeley Unified School District.

I. The City Council shall consider, but need not follow, the Panel's recommendations and shall annually inform the Panel as to the extent to which it has implemented the Panel's recommendations.

Section 7.72.100 Increase Appropriations Limits

Pursuant to California Constitution article XIIIB, the appropriation limit for the City is increased by the aggregate sum authorized to be levied by this tax for each of the four fiscal years from 2015-16 through 2018-19.

Section 7.72.110 Amendment

The City Council, without a vote of the people, may, either permanently or temporarily, increase the dollar amount of the threshold for the small-business exemption in Section 7.72.020.B.

Section 4. Duration.

This Ordinance shall be effective on January 1, 2015. The last effective date of this Ordinance shall be December 31, 2026, and it shall terminate as of January 1, 2027.

Section 5. Severability.
The People of the City of Berkeley hereby declare that they would have adopted each section, sentence, clause, phrase, word, or portion of this Ordinance, irrespective of the fact that any one or more sections, sentences, clauses, phrases, words, or portions of this Ordinance, or any application thereof, be declared invalid or unenforceable and, to that end, the provisions of this Ordinance are severable. If any section, sentence, clause, phrase, word, or portion of this Ordinance, or any application thereof in any circumstance, is for any reason held to be invalid or unenforceable by a court of competent jurisdiction, the remaining sections, sentences, clauses, phrases, words, or portions of this Ordinance, and applications thereof, shall nonetheless remain in full force and effect.

Section 6. Municipal Affair.
A. The People of the City of Berkeley hereby declare that the taxation of the privilege of distributing sugar-sweetened beverage products and that the public health impact of sugar-sweetened beverage products separately and together constitute municipal affairs.
B. The People of the City of Berkeley hereby further declare their desire for this measure to coexist with any similar tax adopted at the county or state levels.

Section 7. California Environmental Quality Act Requirements.
This Ordinance is exempt from the California Environmental Quality Act, Public Resources Code section 21000 et seq., including without limitation Public Resources Code section 21065, CEQA Guidelines section 15378(b)(4) and 15061(b)(3), as it can be seen with certainty that there is no possibility that the activity authorized herein may have a significant effect on the environment and pursuant to Public Resources Code section 21080, subdivision (b)(8) and CEQA Guidelines section 15273 as the approval of government revenues to fund existing services.

The foregoing is a true and correct copy of Ordinance No. 7,388-N.S., and the same was approved by a vote of the electorate of the City of Berkeley on November 4, 2014.

At a regular meeting of the Council of the City of Berkeley held on December 16, 2014 the final adoption of this Ordinance was approved by the following vote:

Ayes: Anderson, Arreguin, Capitelli, Droste, Maio, Moore, Worthington and Bates.

Noes: None.

Absent: Wengraf.

Tom Bates
Tom Bates, Mayor

ATTEST: Mark Numainville
Mark Numainville, CMC, City Clerk

Date signed: December 18, 2014

EXHIBIT D

Implementation Evaluation of Berkeley's Measure D

Report to the City of Berkeley

June 2016

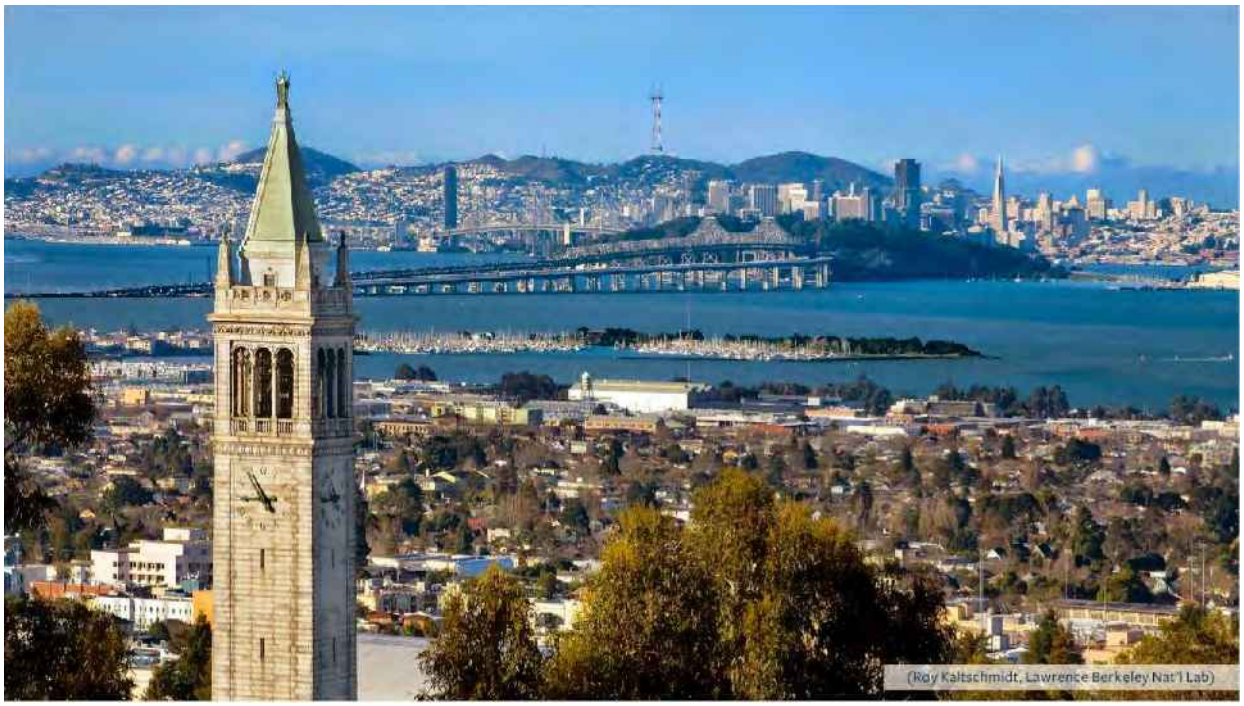


TABLE OF CONTENTS

UC Berkeley School of Public Health
Jennifer Falbe, ScD, MPH
Nadia Rojas, MPH
Anna Grummon, BA
Kristine Madsen, MD, MPH

Acknowledgements
Funding and support for this research was provided by the Laura and John Arnold Foundation and the City of Berkeley. We would also like to acknowledge Lynn Silver, MD, MPH and Suzanne Ryan-Ibarra, MPH, MS of Public Health Institute, who co-conducted a portion of these interviews.

School of Public Health
UNIVERSITY OF CALIFORNIA, BERKELEY

PURPOSE

To understand the implementation process of Measure D and identify lessons learned to (1) inform future efforts by the city of Berkeley around implementation of Measure D and implementation of other health-related ordinances and (2) inform implementation of sugar-sweetened beverage (SSB) taxes in other jurisdictions.

METHODS

UC Berkeley researchers conducted semi-structured interviews with key stakeholders affected by or involved in the implementation of Measure D. Interview guides asked about the following topics:

- Distributor response to the tax
- Retailer response to the tax
- Customer response to price changes
- Ease of tax payments
- Perceived impacts on business
- Barriers and facilitators to smooth implementation and pass-through of the tax
- Timing of implementation events
- Communications
- Recommendations for future health ordinances in Berkeley and for other cities implementing SSB taxes

Interviews were audio-recorded (when the interviewee gave permission), transcribed, and coded into major themes using NVivo 10 qualitative data analysis software.

2015 Sample

From June to November of 2015, UC Berkeley researchers conducted in-depth interviews with SSB distributors, retailers, officials from the city of Berkeley's Public Health Division, and representatives from the tax administrator with which the city contracted collection of the SSB excise tax. UC Berkeley contacted or attempted to contact 27 distributors, of which 5 participated in an interview. None of the national distributors indicated willingness to participate. All chain and independent supermarkets and specialty supermarkets in the city of Berkeley (n=6) were invited to participate in interviews, of which 4 agreed. Other types of retailers were selected via random samples of retailers, stratified by retailer type, among those included in a UC Berkeley study of pass-through of Berkeley's SSB excise tax to higher retail prices.[1] Geographic locations of the majority of these stores were in south and west Berkeley, where a larger proportion of minority and low-income residents reside. Additionally, managers or owners of fast food restaurants, independently owned restaurants and cafes in these neighborhoods, as well as a frequented to-go restaurants near campus were interviewed. Table 1 displays detailed sample sizes.

2016 Sample

In May-June of 2016, independently-owned SSB retailers were re-contacted for interviews to determine if their perspectives and responses to Measure D had changed. Additionally, using a random sample stratified by retailer type, UC Berkeley researchers began interviews with self-distributors in the following categories: small grocery stores, convenience stores, liquor stores, upscale restaurants, moderately-priced restaurants, affordable restaurants, and cafes.

Because UC Berkeley received a confidential list of self-distributors in late May, these interviews are currently in the process of being conducted, transcribed, and analyzed. A subset of results from these interviews are presented in this report, but an updated report will be provided to the City that will contain additional results and greater detail from interviews with self-distributors, as well as interviews with city officials outside of the division of Public Health (i.e., Finance and City Attorney) and members of the commission advising city council on allocation of general revenues. Additional interviews with these stakeholders have been scheduled for July, 2016, later than anticipated, due to interviewee and facilitating contacts' availability.

Table 1. Detailed sample sizes of interview participants through June, 2016

Type of participant	Number
SSB distributors (2015)	5
Retailers (2015)	
Supermarkets (chain or specialty)	4
Small grocery stores	6
Liquor stores	2
Convenience stores	2
Fast food	3
Independent restaurants/cafes	4
Drug store	1
Independent retailers, second interview (2016)	4
Retailers: Self-distributors (2016)	
Small grocery stores	1
Convenience stores	2
Restaurants	3
Cafes	1
City officials (2015)	2
Tax administrators (2015)	2

FINDINGS

Major findings below are organized into bullet points by theme. A sample of illustrative quotes are included for some themes.

Factors facilitating implementation of tax collection

- **High distributor compliance was reported:** "We only show 2 distributors [out of 38] did not file in April….They actually started paying; it's just that it took them a while." –Tax administrator
- **Success of implementation was partly attributed to involvement of and coordination by multiple city departments and officials, including Deputy City Manager, Public Information Officer, Finance, Office of Economic Development, City Attorney, and Public Health.**
- **Hiring an experienced tax administrator:** "Hire [a tax administrator]. That was a wise move." – City official
- **Business licenses, professional affiliations, and the tax administrator's database helped to quickly identify the liable distributors.**
- **Widespread support for the tax by voters and city entities:**
    - "It's a little different in other parts of the country with like a tobacco tax that is not necessarily a vote of the people. Since [Measure D has] been voted on by the people and the city—you know, the commission and the council is behind it—it's been relatively painless so far." – Tax administrator
    - "The measure was very visible and passed very resoundingly. So there is politically a sense of inevitability to it. It didn't squeeze through. It passed by 70-something percent. So that helps with the implementation." – City official
- **Successful outreach to distributors:** "[Distributors] were very active and vocal during the tax payer education sessions. There were 30-something people that attended; all of the distributors were essentially at that session and had tons of questions….So we had the initial tax payer education sessions in February. They received a notification for that via email and paper mail. We also mailed them tax return forms—I guess a welcome packet for lack of better terms—immediately after that, following that meeting" – Tax Administrator
- **Providing a grace period and sufficient notice to distributors prior to collection (at least 30 days prior to effective date).**
- **Simplicity of the structure of the tax, levied per ounce**:
    - "[Calculation of the tax] is actually really simple. [In contrast], tobacco is based, on per pack or per carton, per cigar or per little cigar. They have like 20 different things. A lot of the cities tax all [of these] differently. [Berkeley's SSB tax] is not different based on size of soda, per case, per can, or per 2 liter. A coffee syrup is not taxed differently than soda." -Tax Administrator
    - "The calculation and payment of it is fairly simple now that it is up and running." –Distributor

Barriers to implementation of tax collection

- **Early distributor confusion about calculating ounces of taxable beverage from syrup:** "The biggest challenge has been the syrup. A 5 gallon bag that can make anywhere from 3,000-4,000 ounces of soda. So that is taxable not on how many ounces are in 5 gallons but on what it will produce." – Tax administrator
- **Some early distributor confusion on sweeteners:**
  - "We had some issues with some distributors thinking that they weren't subject to the tax because their sugars were derived from beets." – Tax administrator
  - "So I'm sitting here with a bottle of non-diet Snapple that's all natural, that has sugar in it. Not, you know, corn syrup, just sugar, all natural. So, to me…that drink in itself would not be subject to the tax because it's all natural. So it took me, you know, 15 phone calls to get through to someone before they told me, 'Oh no that drink, Snapple, is subject to the tax.'" –Distributor (who did not attend the educational session)
- **Issues with early communication:**
  - "…an email was sent to our general mailer that was spam-filtered, saying that they had a meeting or something, but otherwise we didn't receive any phone calls; we didn't receive any mail." –Distributor (who did not attend the educational session)
  - "My complaints in the beginning was lack of communication…communication on delay [of implementation] was frustrating. There were limited instructions in the beginning on how to comply." –Distributor

Public Health impact: Barriers to pass-through of the tax

- **In the summer of 2015, among small retailers, a barrier to pass-through was lack of knowledge on what beverages are taxable and on what beverages they are paying higher prices. This is especially problematic because some distributor invoices do not clearly indicate the beverages for which retailers are paying a surcharge or higher price as a result of the SSB excise tax (see the next bullet). However, retailers widely understood that regular soda was taxed. Thus lack of knowledge on which beverages were taxable was more likely to affect pricing and pass-through of non-soda SSBs and non-SSBs. Thus far, second interviews with small retailers in 2016 do not indicate that lack of knowledge on taxable beverages is still a significant problem. Interviews from 2015:**
  - "There is one that I'm a little confused about—the coffee drinks."-Liquor store
  - "For some of the stuff, I don't know if I should [raise the price]…like diet drinks, and some others that say 'artificial sugar.'"– Small grocery
  - "Q: Do you charge the tax on the 100% juice?
    A: Yes, if it has sugar in it."–Small grocery
- **Not all distributor invoices clearly indicate the specific beverages for which retailers are being charged more as a result of the tax. Coke and Pepsi invoices are clear:**
  - "All the other ones [not Coke and Pepsi] kind of lump [the SSB tax surcharge] into one CRV tax per case." –Small grocery

  - "Yeah, they don't tell you which product on the invoice [they are charging more for]. You just kind of have to guess, you know, which products they're talking about." –Liquor store
- **One of the major ways through which both small and large retailers learned of the tax is through communications with their distributors and through their own research.**
- **Related to the above points, many small retailers expressed wanting to have received early information from the city about the tax. That is because even though they do not remit the tax to the city (unless they self-distribute), the tax still affects their business decisions:**
  - "I feel like they just kind of threw something on business to deal with. And it takes a lot to add new, you know, ounces and a new tax for every item that you have in your store. We're a small business, so we're talking about hundreds of products that are being affected all of the sudden. And they expect you to do something but they don't really inform you of the policy." -Small grocery
  - "You know, if you pass a law and it's going to affect my business, you need to let me know what's going on. That hasn't been there at all." -Liquor store
  - **Specifically, small retailers had wanted more details on categories of taxed and untaxed beverages:** "More literature with categories, specifically saying, soda drinks, carbonates, juices, you know, what are the exemptions, and everything else is taxed. That type of information would have been great for us. Because you can go through that and say, 'Okay, yes, no,' and just exclude or include [a price increase] as you're getting the products in." – Small grocery
  - **Retailer and early distributor confusion about "natural sugars" and sweeteners such as honey suggest that a list of example sweeteners that they can look for in ingredient lists may be helpful.**
  - **Multiple suggestions for mode of communication were offered, including in-person visits, educational sessions/meetings, phone calls, mailings, and email. In-person visits or "face-to-face" communications were preferred by many businesses.**
  - **Retailers also wanted resources and information to be able to explain the tax to their customers:**
    - "[A list of taxed beverages] would help a lot. I think it would make everything a lot easier and clear a lot of stuff up. And just having that form at the store, you know, if someone is complaining, just show them. Post it. You know what I'm saying? Sugar tax."-Liquor store
    - "Whatever information we need to be able to answer customer's questions. You know, obviously what the changes to the price would be, or what the tax is and what's affected. Just the basics." –Chain specialty supermarket
- **The time it takes for a small businesses to go through distributor invoices to determine which beverages they are being charged an additional cost due to the tax may have delayed pass-through. This also relates to the above points about lack of knowledge of the tax:** "It takes a lot to add [the cost of a] new tax for every item. We're

still going through the process, and it's June [of 2015]. I think that it would take at least 6 months."—Small grocery store manager

- **Programming of registers / point of sales system. Although multiple businesses, including small stores mentioned the need to program registers, only one retailer, a large, independently owned supermarket, cited this as the reason for not passing-through the tax: "**Because the tax is per ounce, umm, it's very much a challenge for our POS system to handle that."-Large, independently owned supermarket that did not pass-through the tax to retail prices
- **Regional pricing; not wanting different beverage prices across stores in a chain:** "Ultimately, the store regionally made the decision [not to raise beverage prices]. We would not change our pricing structure just for the 2 stores in Berkeley based on the tax….We have plenty of cross-shoppers that shop both our location and [the other city] location frequently. We didn't want to see people wondering why soda was 49 cents there and 39 cents here."- Specialty supermarket

Method for retailer pass-through of the tax

- **Adding the extra cost at the register. The majority of independently owned businesses, especially small grocery and liquor stores and some convenience stores, are adding the cost of the tax at the register through register buttons or by scanning barcodes, so that the extra costs to customers appear on the receipt like a sales tax. Implications of this for consumption are unclear. Many of these stores do not consistently post shelf prices. Thus, at these stores, it is possible that seeing a separate charge for "Berkeley (soda or sugar) tax" may be more salient. Of note, this method of pass-through may have resulted in underestimates of the pass-through rate of the tax in an academic publication relying only on posted price.[2] Our estimates of pass-through relied on cashier report of prices if prices were not posted, but we may still have underestimated pass-through for stores with posted prices or when cashiers did not include the "soda tax" in the price.[1]**
- **Reasons for adding "the tax" at the register are listed below. Some small store managers seemed to think that this was the only way they were "allowed" to pass along costs to consumers.**
    - "We didn't want our prices to reflect higher, because then, the customers would believe that we're collecting it for us." –Small grocery
    - "I don't want people to feel like I am taking advantage of them" –Liquor store
    - "...To explain to [customers] what it is. Because, you know, if you walk in, and I say the price is 99 cents (on the cans of soda that are pre-priced at 99 cents), and then I tell you it's $1.34…how is that $1.34?" –Small grocery
    - "If it is on the receipt…it is easier to explain what the cost is."-Convenience store
- **Chain supermarkets and chain convenience stores added the cost to retail prices:** "We're not physically paying the sugar tax. So corporate felt like we shouldn't be telling the customer…that they're paying a sugar tax because technically, they're not paying the sugar tax. The vendors are paying the sugar tax." –Convenience store

- **Retailers passing through the tax reported only passing it through to higher beverage prices—not to prices of other products like food. Amount of pass-through was reported as one-cent per ounce among these retailers.**

Perceived impacts on business

Although many retailers reported a drop in sales of SSBs, especially soda, the predominant theme was no or only minor impacts on overall business or sales.

Preliminary findings about self-distribution

- **The majority of self-distributors interviewed did not report major difficulty understanding how to calculate the tax, but a couple did complain about the hassle of calculation and having to remit monthly:**
  - "It's difficult, and they want us to pay monthly, which is also a ridiculous thing. I have to do this every month. I can't do it quarterly, or annually, twice a year? Make it easier, like a sales tax; we do it quarterly." -Café
  - "It wasn't super hard, but it's just more work." -Moderately-priced restaurant
- **Receipt of FAQ/educational material or questionnaire for reporting distributors. When UC Berkeley last met with the tax administrator, the tax administrator indicated plans to mail all likely beverage retailers a welcome packet with educational materials, such as the FAQ, and a survey for retailers to list their distributors. None of the self-distributors we interviewed thus far reported seeing these. Although, approximately half the self-distributors admitted not always going through all their mail. They did report having received the remittance form.**
- **Two retailers reported attending the tax payer education day. One found it useful but inefficient due to low turnout. The other had wanted more guidance on tracking amount owed but figured out a method on his own:**
  - **"**Before they implemented the tax, we got one or two mails a month, and then especially the ones about meetings. So they did a really good job about sending out some meetings, which I feel is very important. Otherwise, I wouldn't understand the whole thing at all….During that meeting, there was like, I think about ten people from the city, and I'm sure they're pretty high paid like uh supervisors…and then there's only like four or five store owners that attended. I felt like [they] might have spent like way more money on that and probably not getting much of the message out." –Moderately-priced restaurant
  - "We've asked at the informal meeting they had in December. And they had no clue. I specifically asked them myself if they have any ideas or any suggestions on how we should record this and how we should track this tax. And they said 'no,' so we kind of just came up with our own method, and I guess it works for us." – Convenience store
- **Greater advertising and alternative methods of notification of the tax payer education day may have increased participation. Retailers who did not attend the event expressed interest in it but did not recall having received notification of the event. It is**

unclear if address/phone number lists may have been outdated or if retailers are not going through their mail: "Advertising some sessions in the paper, or something like that, to reach a broader audience. Although you may get some people that the tax isn't subject to." –Tax administrator

Other information about Measure D that retailers would like to receive

- **The desire for more information on how revenues are being spent was widely expressed, including in interviews conducted in 2016.**
    - "I think it would be a good point to have access, to be aware—whether it's through an email or something where people can get informed—just to browse and know where the money has been allocated." –Liquor store owner
    - "Do you know what that measure D or city tax money is being used for? When I talk about this measure D thing, it's real frustrating because again I feel like it took an impact on business….I wish that I could obtain a little more information." –Small grocery
    - "Probably where all the extra money they say is going to be allocated, in more depth. If it is just going to go up to go up, then I don't see a point. If they are going to allocate the money to something more beneficial, then I'd like to see where it is going." –Independent restaurant
    - "I read the local paper, I read the chronicle. I've never seen anything talk about how the money is spent. Obviously, [it's] five months into [collection from self-distributors] already. You would think there would be some kind of literature on it." –Self-distributing convenience store
- **Several retailers also did not understand the rationale for the tax and why SSBs were the target.**

Retailer advice for the city on implementing future health-related ordinances and programs

- **In-person outreach to inform businesses of new laws:** "Have a representative go. All you need is just one person. Make them go to maybe 10 stores a day. If there's a new law that's going to affect [us], have a representative from the city come in and inform you, give you a little information. Any time a law is passed, I have to find about it all myself, or through the grapevine, through someone else, through, you know, a letter. It would be nice to just have that one-on-one, you know?" – Liquor store.
- **Send out more communications:** "Actually try to send out mail? They do have a list to send out fees or formalities or anything. They could just use the same address and send like a small thing saying 'hey, you know, we're introducing this and that.' We didn't know about the Styrofoam thing until like four years into the thing and then the health inspector [told us about it]. A notification system…. Yeah it might mean taking emails from each business. Pay a guy something to go around and take your email and phone number and send out maybe a text? Or make a City of Berkeley app and tell everybody to join it." – Independent restaurant.
- **Address other concerns, like safety, and focus on disadvantaged neighborhoods:** "Maybe be more involved with the more needy communities in the city, especially on the west side here. I think the businesses around here need a little freshening up.

People need to feel safer walking around in this area, so that they can go into these businesses and shop. That's where I would focus because when people feel comfortable, they'll go into any shop. And they'd rather go closer than to go far away when they feel safer." – Small grocery store.

- **Healthy Retail: Provide education, connect small stores with distributors of healthy foods, help with promotion, and provide spoilage credit:**
  - "There's always information to be handed out, or helpful hints, or anything that's helpful and would lead us to the right direction. I'm always willing to try new things….info, education, or even hooking us up with the distributors. And having the city, obviously, talk to them also. You know, we're trying to do this for the city, you know, these are smaller markets. We want you to respect and help the smaller stores out, as far as, you know, pricing, credits, advertising. I think all that would really help us out." – Small grocery
  - "Maybe there has to be some type of program or something where we can get, you know, better education as far as connections to vendors, or things that, um, might make it easier for us to provide these products to people at a better price. Education and information about vendors." –Small grocery
  - "Mention a few distributors who work with Whole Foods or the bigger chain stores that want to work with us, and help us out the same way that they do it. Because I imagine that if they have things that go bad, they might get credit for it. I don't think they take a complete loss." –Small grocery

SUMMARY OF FINDINGS AND RECOMMENDATIONS

High distributor compliance with payment of the tax was reported. Only minor barriers to payment of the tax were related to misunderstandings about sweeteners and how to calculate taxable ounces of SSBs from syrups. Facilitators to successful implementation of tax collection included coordination among multiple city departments and officials, contracting with an experienced tax administrator, ease of identifying liable distributors from existing lists, high public support for the tax, simplicity of calculating the tax, provision of sufficient notice to distributors prior to the effective date of the tax, and the provision of technical assistance and education to distributors.

Retailers learned about the tax through communications with distributors and through their own research. Barriers to pass-through of tax among large retailers included regional pricing and complications with updating their point-of-sale system. For small retailers, barriers to early pass-through included lack of knowledge about which non-soda beverages were taxable, leading to indecision on how to raise beverage prices. Lack of retailer knowledge on taxable beverages was compounded by the fact that many distributor invoices did not indicate the specific beverages for which they increased prices. Some of these invoices only listed a single total surcharge for the "Berkeley SSB tax." Due to having fewer resources, it took smaller retailers more time to review invoices and to determine how they would price their beverages. Small retailers, in particular, reported wanting to have received information from the city about the tax early on, including which categories of beverages were taxed and exempt. Retailers also

wanted information they could provide to their customers. Retailers suggested multiple formats for communication from the city but focused particularly on in-person and face-to-face communication.

Retailers and distributors passing through the tax were charging an additional penny-per-ounce and did not report spreading costs to non-SSBS or non-beverages. Independently owned retailers, especially small grocery and liquor stores and some convenience stores, reported charging tax-related costs at the register instead of raising retail prices. In contrast, larger businesses and chains added additional costs to retail prices.

Thus far, self-distributors did not report major barriers to calculating and paying the tax, but some mentioned that it was tedious, especially to pay monthly.

In 2015 and 2016, retailers widely indicated that they would like to receive information on how Measure D tax revenues were being spent. It also appears that they would benefit from information about why SSBs were the target of the tax.

Future jurisdictions implementing SSB excise taxes may benefit from following the steps that the City of Berkeley took to ensure distributor compliance with payment, but exact steps that should be taken may depend on city size and characteristics. A major lesson learned is that, although retailers are not generally liable for the tax, early and clear communication with retailers could facilitate pass-through of the tax to only taxable beverages. Tools that would be helpful to retailers, especially smaller ones, include lists of categories of beverages generally taxable and exempt and information that retailers can show to their customers who have questions about price increases. Because it is easy for mail to be overlooked, when resources permit, cities should consider in-person outreach to retailers.

REFERENCES

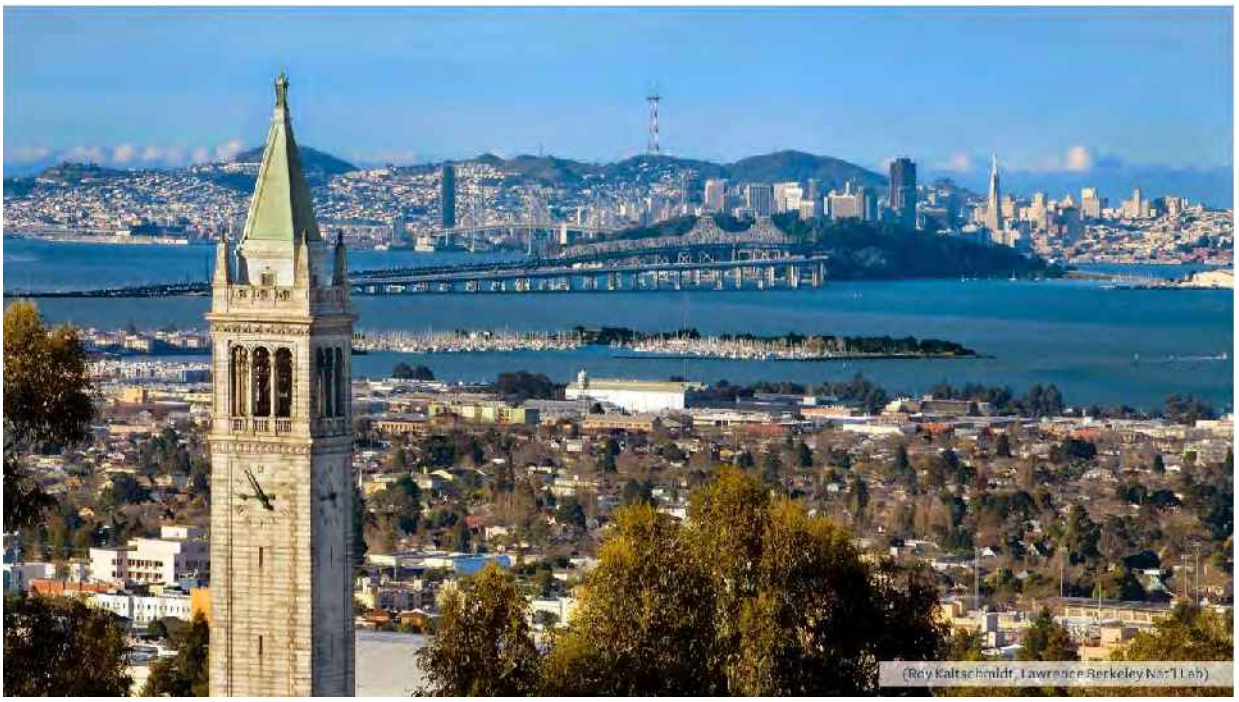
1. Falbe J, Rojas N, Grummon AH, Madsen KA. Higher retail prices of sugar-sweetened beverages 3 months after implementation of an excise tax in Berkeley, California. *Am J Public Health.* Nov 2015;105(11):2194-2201.
2. Cawley J, Frisvold D. *The Incidence of Taxes on Sugar-Sweetened Beverages: The Case of Berkeley, California.* 2015.

EXHIBIT E

Implementation Evaluation of Berkeley's Measure D

Report to the City of Berkeley

September 2016



UC Berkeley School of Public Health
Jennifer Falbe, ScD, MPH
Nadia Rojas, MPH
Anna Grummon, BA
Kristine Madsen, MD, MPH

Acknowledgements
Support for this research was provided by the Laura and John Arnold Foundation and the City of Berkeley. Lynn Silver, MD, MPH and Suzanne Ryan-Ibarra, MPH, MS of Public Health Institute facilitated and co-conducted a portion of these interviews.

School of Public Health
UNIVERSITY OF CALIFORNIA, BERKELEY

BACKGROUND

Berkeley's 2014 ordinance, Measure D, established the nation's first sugar-sweetened beverage (SSB) excise tax for public health purposes. It also established an advisory committee, called the SSB Product Panel of Experts (SSBPPE), to advise the City on spending general revenues to further reduce the consumption of SSBs and address the consequences of such consumption.

PURPOSE

To understand the implementation process of Measure D and identify lessons learned to inform future efforts of the City of Berkeley to implement health-related ordinances and of other jurisdictions that may implement SSB excise taxes.

METHODS

From June 2015 to August 2016, UC Berkeley researchers conducted in-depth interviews with stakeholders affected by or involved in the implementation of Measure D. Interview guides included topics such as business response to the tax, ease of tax collection and payment, barriers and facilitators to smooth implementation, and communications. Interviews were audio-recorded, transcribed, and coded into major themes using NVivo 10 software (QSR).

Sample. Interviews were conducted with SSB distributors; Berkeley beverage retailers; City of Berkeley staff representing public health, finance, and legal perspectives; City Commissioners serving on the SSBPPE, and the City's contracted tax administrator. The sample is described in Table 1. Businesses were selected using random sampling, stratified by business type, from a list of distributors, a list of likely self-distributors, and retailers included in a previous study of SSB prices in Berkeley.[1] UC Berkeley's dining operation was also interviewed.

Table 1. Detailed sample sizes of interview participants

Type of participant	Number
SSB distributors	5
Retailers	
Supermarkets (chain or specialty)	4
Small grocery stores	11 (6)
Liquor stores	2
Convenience stores	5 (2)
Independent restaurants/cafes	9 (8)
Drugstore	1
UC Berkeley dining	1
Total retailers	33
Independent retailers, 2nd interview	6
City staff and officials	5
Tax administrator	2
SSBPPE Commissioners	2

Parenthesis indicates the number of likely self-distributors among the total.

KEY RECOMMENDATIONS & LESSONS LEARNED FOR BERKELEY AND OTHER JURISDICTIONS

- **Employ strategies found to facilitate successful implementation of an SSB excise tax in Berkeley:**
  - **Coordinate among multiple city departments and divisions.**
  - **Adequately staff at least one full-time position to coordinate implementation activities. This position should be established from the start and be long-term for program stability and continuity of communications. Larger cities should consider multiple full-time positions.**
  - **Contract with an experienced tax administrator.**
  - **Provide technical assistance, educational outreach, and sufficient notice to distributors prior to the effective date of the tax.**

- **Conduct an additional round of outreach with retailers and self-distributors. This will educate new retailers and new retail staff, provide refresher information to existing retailers, and provide new information that retailers indicated they would like to receive. Relevant information to include:**
  - **Basic and easy-to-understand information about the tax, such as lists of example taxed and exempt beverage categories and caloric sweeteners.**
  - **A clear but voluntary recommendation that the best practice for public health and diabetes prevention is to make up for any added costs by raising prices of taxed SSBs only and not other beverages**. (No retailers reported raising prices of non-beverage items.)
  - **Information on how revenues are being used as a result of SSBPPE recommendations.**
  - **Educational materials or signage that retailers can use to show to customers, which describe the purpose of the tax and to which beverages it applies. If customers have questions, materials could contain the City's contact information.**

- **Use multiple modes of communication with business when possible: In-person visits, mail, email, and phone calls. Include communications with other important mailings from the city to minimize the chance it will be overlooked (e.g., with new business licenses). Because mail can be overlooked, communication efforts should include in-person outreach to retailers, which may also facilitate engagement and acceptance.**

- **Continue to ensure that programs funded as a result of SSBPPE are within the scope of the Ordinance: "to further reduce the consumption of sugar-sweetened beverages in Berkeley and address the consequences of such consumption;" require that funding for this purpose does not replace existing funding; and require evaluation and reporting provisions.**

- **Engage in robust outreach efforts to continually educate, inform, and update the public on the purpose and process of implementing Measure D and how the city is working to reduce SSB consumption and improve the health of Berkeley residents. Other jurisdictions implementing similar legislation should engage in such outreach efforts starting in the first year of implementation.**

DETAILED FINDINGS

The findings below, which are organized by theme, formed the basis for the Key Recommendations and Lessons Learned above.

Factors facilitating implementation of tax collection

- **High compliance among major distributors was reported.**
- **Quick and successful implementation was attributed to close coordination among multiple city departments and officials.**
- **Contracting with an experienced tax administrator was "a wise move."** – City official
- **Business licenses, professional affiliations, and the tax administrator's database helped to quickly identify liable distributors.**
- **Widespread support for the tax by voters and city entities:** "Since [Measure D has] been voted on by the people…the [SSBPPE] commission and the [City] Council is behind it—it's been relatively painless so far." – Tax administrator
- **Successful outreach to distributors:** "[Distributors] were very active and vocal during the tax payer education sessions. There were 30-something people that attended. They received a notification for that via email and paper mail. We also mailed them tax return forms." – Tax Administrator
- **Providing a grace period and sufficient notice to distributors prior to collection (≥30 days prior to effective date).**
- **Simplicity of the structure of the tax, levied per ounce**: "The calculation and payment of it is fairly simple now that it is up and running." – Distributor

Barriers to implementation of tax collection

- **Early lack of clarity among some distributors on:**
  - **Calculating ounces of taxable beverage from syrup:** "The biggest challenge has been the syrup. So that is taxable not on how many ounces are in 5 gallons but on what it will produce." – Tax administrator
  - **Sweeteners:** "We had some issues with some distributors thinking that they weren't subject to the tax because their sugars were derived from beets." – Tax administrator
- **Not all distributors were reached with early communication:** "…an email was sent to our general mailer that was [sent to] spam." – Distributor

Tax pass-through

- **Among retailers that decided to make up for any higher costs from SSB distributors, the majority reported raising the price of only taxed SSBs.**

- **No retailer reported raising the price of non-beverage items as a result of the tax.**
- **Some retailers ceased selling SSBs or participating in special promotions for SSBs as a result of the tax:** "We started stocking more juices. I actually have milk and chocolate milk. We don't sell any soda anymore." – Small Grocery

Revenue and the Panel of Experts

- **Measure D generated more revenues than anticipated.**
- **Swift establishment of the SSB Product Panel of Experts** (SSBPPE) facilitated City Council's timely decisions to establish and fund programs to reduce the consumption of SSBs in Berkeley and to address the effects of such consumption.
- **Interviews indicated that the SSBPPE's membership reflects the appropriate areas of expertise and that city council has acted on the SSBPPE's recommendations, resulting in the funding of school programs and healthy beverage education, as well as a variety of community programs addressing community health promotion and the reduction of health disparities. Interviewees noted the importance of funding programs within the scope of the ordinance, including evaluation and reporting standards, and ensuring that funds do not replace existing funding.**

Findings about self-distribution

- **The majority of self-distributors interviewed did not report major difficulty understanding how to calculate the tax.** "It wasn't super hard, but it's just more work." – Independent restaurant
- **Some reported not having seen detailed information on taxable beverages. Interviews suggest that self-distributors may benefit from additional outreach on taxable beverages other than soda and exemptions, especially for diet beverages.**
- **Three of the self-distributors interviewed reported attending the Tax Payer Education Day at the end of 2015. Most found it useful:** "[it was] very important. Otherwise I don't understand the whole thing at all." – Independent Restaurant. Despite perceived benefits noted by those attending, turnout was low.
- **Greater or alternative means of advertising the Tax Payer Education Day may have increased participation. Retailers who did not attend the event expressed interest, but either did not recall having received notification or mentioned limited time as a barrier to traveling to a specific event.**

Enhancing communication

- **Although retailers are not liable for the tax (unless they self-distribute), small retailers would have liked to receive early information about the tax because it affects their business decisions:**
    - **Specifically, small retailers wanted more details on categories of taxed and untaxed beverages:** "More literature with categories, specifically saying, soda drinks, carbonates, juices, you know. What are the exemptions? That type of information would have been great for us. Because you can go through that and

say, 'Okay, yes, no,' and just exclude or include [a price increase] as you're getting the products in." – Small grocery
    - **Some retailers' and distributors' lack of clarity about whether beverages containing "natural sugars" and sweeteners such as honey were taxable suggest that a list of example caloric sweeteners may be helpful.**
    - **Retailers wanted resources and information to be able to explain the tax to their customers:**
        - "[It would be helpful to have] whatever information we need to be able to answer customer's questions. You know, obviously what the changes to the price would be, or what the tax is and what's affected. Just the basics." – Chain specialty supermarket
        - "[A list of example taxed beverages] would help a lot. I think it would make everything a lot easier…if someone is complaining, just show them. Post it. You know what I'm saying? Sugar tax." – Liquor store
- **The desire for more information on how revenues are being spent was widely expressed, including in interviews conducted in 2016.**
    - "Where's the money going? Hopefully to a good place." – Small grocery
    - "If they are going to allocate the money to something more beneficial, then I'd like to see where it is going." –Independent restaurant
- **Several retailers also did not understand the rationale for why SSBs were the target. This information should be widely available to retailers and the public.**
- **Multiple modes of communication were preferred, including in-person visits, educational meetings, phone calls, mailings, and email. In-person visits or "face-to-face" communications were widely preferred by smaller businesses.**

Retailer advice for the city on implementing future health-related ordinances and programs

- **In-person outreach to inform businesses of new laws:** "Have a representative go. All you need is just one person. Make them go to maybe 10 stores a day….It would be nice to just have that one-on-one, you know?" – Liquor store.
- **Address other concerns, like safety, and focus on disadvantaged neighborhoods:** "Maybe be more involved with the more needy communities in the city, especially on the west side here. I think the businesses around here need a little freshening up. People need to feel safer walking around in this area."– Small grocery
- **Retailers said that healthy retail programs should consider connecting small stores with distributors of healthy foods, help with promotion, and provide spoilage credit.**

REFERENCES

1. Falbe J, Rojas N, Grummon AH, Madsen KA. Higher retail prices of sugar-sweetened beverages 3 months after implementation of an excise tax in Berkeley, California. *Am J Public Health.* 2015;105(11):2194-2201.

EXHIBIT F

PLOS | MEDICINE

RESEARCH ARTICLE

Changes in prices, sales, consumer spending, and beverage consumption one year after a tax on sugar-sweetened beverages in Berkeley, California, US: A before-and-after study

Lynn D. Silver[1☯], Shu Wen Ng[2,3☯], Suzanne Ryan-Ibarra[1], Lindsey Smith Taillie[2,3], Marta Induni[1], Donna R. Miles[3], Jennifer M. Poti[2], Barry M. Popkin[2,3]*

1 Public Health Institute, Oakland, California, United States of America, **2** Department of Nutrition, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, United States of America, **3** Carolina Population Center, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, United States of America

☯ These authors contributed equally to this work.
* popkin@unc.edu

Citation: Silver LD, Ng SW, Ryan-Ibarra S, Taillie LS, Induni M, Miles DR, et al. (2017) Changes in prices, sales, consumer spending, and beverage consumption one year after a tax on sugar-sweetened beverages in Berkeley, California, US: A before-and-after study. PLoS Med 14(4): e1002283. https://doi.org/10.1371/journal.pmed.1002283

Academic Editor: Claudia Langenberg, University of Cambridge, UNITED KINGDOM

Received: November 9, 2016

Accepted: March 10, 2017

Published: April 18, 2017

Data Availability Statement: Data are from the UNC-PHI Berkeley Evaluation of SSB Tax study. Datasets from the de-identified telephone survey and from the 26 store survey can be made fully available without restriction upon request. The retail scanner data set is available in aggregate form combined across chains due to confidentiality restrictions required when obtaining voluntary data sharing from stores. The databases and accompanying documentation are available at:

Abstract

Background

Taxes on sugar-sweetened beverages (SSBs) meant to improve health and raise revenue are being adopted, yet evaluation is scarce. This study examines the association of the first penny per ounce SSB excise tax in the United States, in Berkeley, California, with beverage prices, sales, store revenue/consumer spending, and usual beverage intake.

Methods and findings

Methods included comparison of pre-taxation (before 1 January 2015) and first-year post-taxation (1 March 2015±29 February 2016) measures of (1) beverage prices at 26 Berkeley stores; (2) point-of-sale scanner data on 15.5 million checkouts for beverage prices, sales, and store revenue for two supermarket chains covering three Berkeley and six control non-Berkeley large supermarkets in adjacent cities; and (3) a representative telephone survey (17.4% cooperation rate) of 957 adult Berkeley residents.

Key hypotheses were that (1) the tax would be passed through to the prices of taxed beverages among the chain stores in which Berkeley implemented the tax in 2015; (2) sales of taxed beverages would decline, and sales of untaxed beverages would rise, in Berkeley stores more than in comparison non-Berkeley stores; (3) consumer spending per transaction (checkout episode) would not increase in Berkeley stores; and (4) self-reported consumption of taxed beverages would decline.

Main outcomes and measures included changes in inflation-adjusted prices (cents/ounce), beverage sales (ounces), consumers' spending measured as store revenue (inflation-adjusted dollars per transaction) in two large chains, and usual beverage intake (grams/day and kilocalories/day).

http://globalfoodresearchprogram.web.unc.edu/research-in-the-united-states/u-s-policy-evaluations/Berkeley-SSB-Tax

Funding: Funding for this study came primarily from the Bloomberg Philanthropies, with support from the Carolina Population Center and its NIH Center grant (P2C HD050924) at The University of North Carolina at Chapel Hill. Funders had no role design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Competing interests: BMP is on an NAS committee focused on preschool beverage consumption, chairs the Choices International Foundation scientific committee, has been a co-investigator of one random controlled trial funded by Nestle's Water USA, but has never consulted for them. BMP presented a paper on SSB global trends in a symposium at the British Nutrition Society symposium sponsored by Danone Waters. LDS is a volunteer board member of the Center for Science in the Public Interest and has worked as a consultant, both paid and volunteer, for the World Health Organization, and organizations which have advocated for sugar sweetened beverage taxes. LDS has also donated to Berkeley's Measure D and advocated for its approval. SWN is on the expert advisory committee for the Philadelphia sweetened beverage tax evaluation project that is being conducted by researchers at University of Pennsylvania and Harvard University.

Abbreviations: CPI, Consumer Price Index; SSB, sugar-sweetened beverage.

Tax pass-through (changes in the price after imposition of the tax) for SSBs varied in degree and timing by store type and beverage type. Pass-through was complete in large chain supermarkets (+1.07¢/oz, $p = 0.001$) and small chain supermarkets and chain gas stations (1.31¢/oz, $p = 0.004$), partial in pharmacies (+0.45¢/oz, $p = 0.03$), and negative in independent corner stores and independent gas stations (−0.64¢/oz, $p = 0.004$). Sales-unweighted mean price change from scanner data was +0.67¢/oz ($p = 0.00$) (sales-weighted, +0.65¢/oz, $p = 0.003$), with +1.09¢/oz ($p < 0.001$) for sodas and energy drinks, but a lower change in other categories. Post-tax year 1 scanner data SSB sales (ounces/transaction) in Berkeley stores declined 9.6% ($p < 0.001$) compared to estimates if the tax were not in place, but rose 6.9% ($p < 0.001$) for non-Berkeley stores. Sales of untaxed beverages in Berkeley stores rose by 3.5% versus 0.5% (both $p < 0.001$) for non-Berkeley stores. Overall beverage sales also rose across stores. In Berkeley, sales of water rose by 15.6% ($p < 0.001$) (exceeding the decline in SSB sales in ounces); untaxed fruit, vegetable, and tea drinks, by 4.37% ($p < 0.001$); and plain milk, by 0.63% ($p = 0.01$). Scanner data mean store revenue/consumer spending (dollars per transaction) fell 18¢ less in Berkeley (−$0.36, $p < 0.001$) than in comparison stores (−$0.54, $p < 0.001$). Baseline and post-tax Berkeley SSB sales and usual dietary intake were markedly low compared to national levels (at baseline, National Health and Nutrition Examination Survey SSB intake nationally was 131 kcal/d and in Berkeley was 45 kcal/d). Reductions in self-reported mean daily SSB intake in grams (−19.8%, $p = 0.49$) and in mean per capita SSB caloric intake (−13.3%, $p = 0.56$) from baseline to post-tax were not statistically significant.

Limitations of the study include inability to establish causal links due to observational design, and the absence of health outcomes. Analysis of consumption was limited by the small effect size in relation to high standard error and Berkeley's low baseline consumption.

Conclusions

One year following implementation of the nation's first large SSB tax, prices of SSBs increased in many, but not all, settings, SSB sales declined, and sales of untaxed beverages (especially water) and overall study beverages rose in Berkeley; overall consumer spending per transaction in the stores studied did not rise. Price increases for SSBs in two distinct data sources, their timing, and the patterns of change in taxed and untaxed beverage sales suggest that the observed changes may be attributable to the tax. Post-tax self-reported SSB intake did not change significantly compared to baseline. Significant declines in SSB sales, even in this relatively affluent community, accompanied by revenue used for prevention suggest promise for this policy. Evaluation of taxation in jurisdictions with more typical SSB consumption, with controls, is needed to assess broader dietary and potential health impacts.

Author summary

Why was this study done?

- Berkeley passed the first large (one cent per ounce) tax on sugar-sweetened beverages (SSBs) in the United States in November 2014, affording a unique opportunity for evaluation.

- It was unknown to what extent people would change beverage purchasing in response to a tax, especially in a relatively prosperous community.
- Few high-quality evaluations from other countries existed; studies of Mexico's tax (implemented starting January 2014) found substantial but not complete [a]pass-through[o] of the tax to consumers for taxed beverages, a 6% reduction in sales in the first year, and a 9% decrease in sales to lower-income households.

What did the researchers do and find?

- Three before-and-after studies were carried out: one of store scanner records from 15.5 million checkouts in two chains of large groceries in Berkeley and comparison cities; one of 26 stores of various types in Berkeley; and one random digit dialing telephone survey of consumption by Berkeley residents.
- In the 15.5 million supermarket checkouts studied, 67% of the amount of the tax was passed on to consumers across all SSBs, and the tax was fully passed through for sodas and energy drinks; in the 26-store survey, the tax was more than fully passed on in Berkeley large and small chain groceries and gas stations, especially for carbonated beverages; partially passed on in pharmacies; and not passed on in small independent gas stations and corner stores.
- Sales in ounces of taxed SSBs fell by 9.6% in relation to predicted sales in the absence of the tax, while sales of untaxed beverages rose 3.5% and total beverage sales rose in Berkeley. Consumer spending per transaction (average grocery bill) did not increase, nor did store revenue fall more in Berkeley, while SSB sales rose 6.9% in comparison cities.
- Berkeley residents were low consumers of SSBs at baseline (consuming only 34% of the national average of SSBs). Dietary intake surveys found shifts of −19.8% ($p = 0.49$) in mean daily SSB intake (grams) and −13.3% ($p = 0.56$) in mean calories from SSBs that were not statistically significant, while caloric intake of untaxed beverages (milk and other diary-based beverages) increased.

What do these findings mean?

- Berkeley's innovative tax on SSBs was mostly, though not uniformly, passed through to consumers, and sales of SSBs declined significantly, consistent with published price elasticity estimates.
- There was no evidence in studied chains of higher grocery bills for consumers, loss of gross revenue per transaction for stores, or decreases in overall beverage sales for stores. While telephone respondents did not report changes in shopping location, scanner data were consistent with some increased purchasing of SSBs in neighboring cities.
- The findings of this study, while limited by its observational design, suggest that SSB taxes may be effective in shifting consumers to purchase healthier beverages without causing undue economic hardship and while raising revenue for social objectives.

- Population-based findings on SSB consumption were not definitive, and consumption should be further evaluated in more typical communities and with larger samples.

Introduction

Sugar-sweetened beverage (SSB) consumption is linked to increased body weight, diabetes, cardiovascular risk factors, and dental caries, amongst other conditions [1,2]. Significant SSB taxes have been proposed and increasingly adopted as part of a comprehensive approach to obesity and diabetes prevention [3±5] with extensive potential health and social benefits [2,5±7]. Over 20 countries have passed strengthened SSB taxes of varying sizes, with a growing emphasis on larger excise taxes [6,8±10].

Berkeley, California, is the first US jurisdiction to successfully place a substantial excise tax on SSB distributors, with the dual goals of reducing consumption and raising revenue for efforts to prevent obesity and diabetes. The tax, approved by voters in November 2014, is one penny per fluid ounce (1¢/oz) on beverages with added caloric sweeteners. In theory, the tax might add 68¢ to the price of a 2-l (68-oz) bottle of soda, typically priced a little over $2 before the tax, or 12¢ to a 12-oz can, sold for around $1. In late January 2015, the city delayed the original 1 January 2015 implementation until 1 March 2015 among the 38 largest beverage distributors [11]. Tax collection from small retailers obtaining their own supplies (ªself-distributorsº) only began 1 January 2016. In 2016, other US jurisdictions, including three large citiesÐ Philadelphia (Pennsylvania), San Francisco (California), and Oakland (California)Ðand Cook County (Illinois), which encompasses Chicago's metro area, as well as two smaller citiesÐ Boulder (Colorado) and Albany (California)Ðfollowed suit, with similar measures at tax levels from 1¢/oz to 2¢/oz.

The Berkeley tax therefore offered a unique opportunity to evaluate this policy. This study sought to examine (1) whether and how the tax was passed through to beverage prices, (2) whether the volume of beverages sold changed, (3) whether store revenues/consumer spending per transaction within these stores changed, and (4) whether beverage consumption changed. This study evaluates changes in the first year of implementation (March 2015±February 2016).

Methods

Three data collection approaches were employed to measure beverage prices, volume sold, store revenue (or, conversely, consumer spending), and beverage intake. Fig 1 illustrates the tax implementation and study data collection timeline. Key elements of analyses were determined prospectively; however, some adjustments were required, particularly as we received and analyzed store scanner data.

This study was approved by institutional review boards of the Public Health Institute and the University of North Carolina at Chapel Hill.

Setting. The city of Berkeley, located in California's Bay Area, had an estimated 121,000 inhabitants in 2015 and covers only 10.5 square miles. Residents are 55% non-Hispanic white, 19% Asian, 11% Hispanic or Latino, 10% African-American, and 21% foreign-born. Berkeley is home to a large public university and a very highly educated population, with 71% of those over age 25 y holding a bachelor's degree or higher. Nevertheless, it has a high percentage of residents in poverty (20.4% versus 15.3% for California and 13.5% nationwide), though the

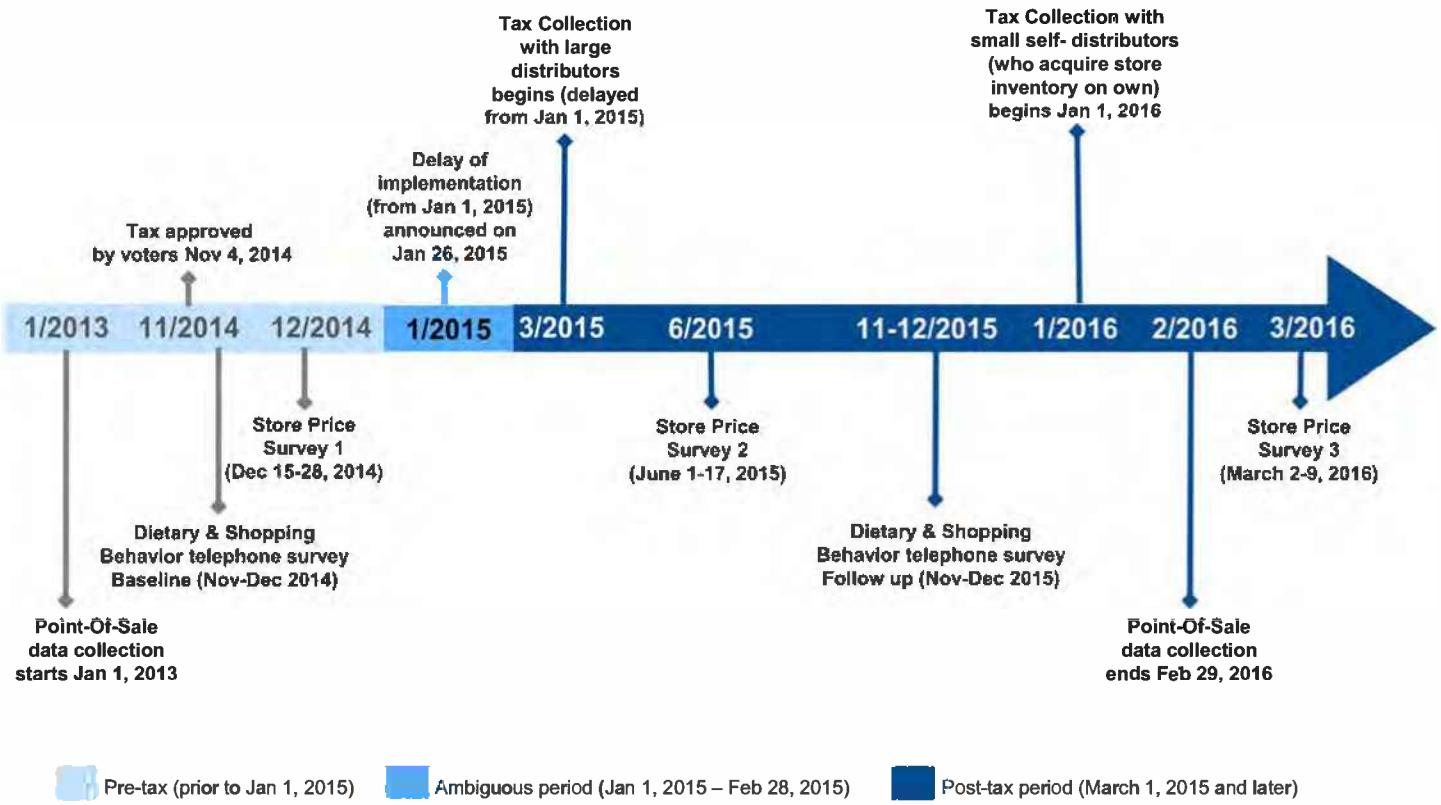


Fig 1. Berkeley sugar-sweetened beverage tax implementation and evaluation timeline.

https://doi.org/10.1371/journal.pmed.1002283.g001

median income of $66,237 is about 10% above the median for the state as a whole and 23% above the US median [12].

Store price surveys. Store price surveys were conducted in December 2014 (pre-tax), June 2015 (4 months post-tax), and March 2016 (13 months post-tax, and 2 months into self-distributor tax collection) among a targeted sample of large supermarkets, small chain supermarkets, chain and independent gas stations, pharmacies (drugstores), and independent corner stores located in Berkeley, California ($n = 26$). Six top stores were identified from the telephone survey (described below), and the remainder were selected randomly within their type. Store price surveys collected 744 prices in December 2014, 798 prices in June 2015, and 633 prices in March 2016 for a standard panel of 70 beverages, which included 45 taxed and untaxed branded beverages in a variety of sizes. It was possible to collect 313 prices for 55 of the 70 products in the standard panel in all three rounds in the same stores. S1 Text provides details on the store price survey design.

Point-of-sale data. Point-of-sale electronic scanner data were requested using personal outreach to all large supermarkets in Berkeley, as well as to pharmacies, small supermarkets, ethnic markets, convenience stores, and gas stations with scanner systems, and with extensive follow-up as needed to owners or corporate headquarters. Ultimately, two chains of large supermarkets with three of the city's nine large groceries provided electronic data covering 1 January 2013 through 29 February 2016 (26 months pre-tax; 12 months post-tax). They also provided data on six Bay Area control stores. Data covered 118.8 million barcode scans from 15.5 million transactions (checkout episodes), with 16.2 million barcode scans involving beverages (16,769 unique barcodes), of which 10.8 million barcode scans (5,631 unique barcodes)

are included here. S2 Text describes the point-of-sale study design and the stores and beverage products included in our analyses. The tax status of each beverage was classified using the Berkeley law [13], nutrition data from product websites, and ingredient data from Mintel [14].

Dietary and shopping behavior surveys. These telephone surveys were conducted November±December 2014 (pre-tax/baseline) and November±December 2015 (post-tax/follow-up). The sample was identified using dual frame (landline/cellular) random digit dialing that oversampled lower income census blocks (>50% of households with annual gross household income <$100,000) in Berkeley. Only Berkeley residents were interviewed. Oral informed consent was obtained from all participants. Trained interviewers used standardized questionnaires and computer-assisted telephone interviews to collect information on beverage shopping locations and behaviors, demographics, and 24-h recall of beverage intake [15]. To adjust for typical daily intake, a second 24-h beverage recall interview was collected 3±7 d later from consenting respondents.

Sampling weights were calculated using iterative proportional fitting (raking) [16] to adjust the data to demographic proportions for Berkeley, California, obtained from the United States Census Bureau for 2010 [12]. Details on the sample design, other methods, and response rates are found in S5 Text. Caloric intake from beverages consumed was calculated using nutrition data from product websites, nutrition facts panel data from Mintel [14], and US Department of Agriculture databases [17,18].

Analytical approaches

Changes in prices. Prices were calculated based on prices paid, excluding sales tax and California Redemption Value bottle fee. Inflation-adjusted prices were derived by applying the US Bureau of Labor Statistics Consumer Price Index (CPI) for the monthly average price of non-alcoholic beverages [19] to price measures, using January 2013 as the base. To measure changes in price after imposition of the tax, known as ªpass-through,º using prices from the store price surveys, we compared the mean prices in cents/ounce of beverage products collected across the 26 stores in Berkeley at three time points (December 2014, June 2015, and March 2016) using paired *t*-tests. Data were analyzed using only beverages that could be matched for product and size across all three rounds, reflecting same product prices, rather than total consumer experience. For details see S1 Text.

Point-of-sale data included repeated measures of beverages sold (at barcode level) at both Berkeley and non-Berkeley stores, during both pre-tax and post-tax periods (see S2 Text for details). We used a fixed effects approach using the price (cents/ounce) of taxed beverages per barcode-month-store as the outcome, controlling for month-year (relative to January 2013) and potential underreporting due to data that were missing completely at random because of technical (data storage) issues for some stores on random days that contributed to the monthly value. For model specifications, see S3 Text. From the models, adjusted beverage prices (cents/ounce) in Berkeley versus non-Berkeley stores overall and by beverage category were derived. Since the tax implementation timeline was altered, the January±February 2015 period was ambiguous with regards to tax implementation and price change, so we compared prices from March±December in 2016 to the same 10-month period in earlier years. All analyses were conducted in Stata 13 [20].

Changes in sales and store revenue (consumer spending). Store-day data on the volume of taxed and untaxed beverages (ounces per transaction) and average daily store revenues (CPI-adjusted dollars per transaction) from all sales were the key outcomes and were modeled separately. We examined whether there were differences in these outcomes in non-Berkeley stores by distance from Berkeley. Comparison stores were classified into zones: zone 1,

adjacent to Berkeley (two stores in two cities); zone 2, San Francisco (one store); and zone 3, ≥20 miles (three stores in three cities) (see map in S4 Text). Since the beverage volume distributions (and their residuals) were skewed, outcomes were log-transformed to normalize distributions. For the volume outcomes, ordinary least squares models were used, with controls for store ID, day of week, holiday and holiday eve, month, year, number of transactions (linear and quadratic), a post-tax indicator, and interactions of store ID with the post-tax indicator, month, and year, correcting the standard errors by clustering the analyses at the city level. A similar model was used for revenue per transaction (a measure of the gross revenue for the stores as well as customer's spending in these stores), excluding number of transactions as a control.

To test whether the post-tax trend in sales differed significantly from the pre-tax trend, we predicted taxed and untaxed beverage sale volume and store revenue per transaction if the post-tax indicator = 0 during March 2015±February 2016 (i.e., a [a]counterfactual[o] for if the tax had not been implemented [9]) and compared these predicted values to the adjusted volumes observed during the post-tax period. For detailed specifications, see S4 Text.

Changes in usual intake of beverages. Using a repeated cross-sectional approach, the National Cancer Institute method was used to estimate the usual intake distribution (kilocalories/day and grams/day) of taxed and untaxed beverages in each year, controlling for age, gender, race/ethnicity, education, income, weekend (including Friday), and recall sequence [21,22]. To account for the large proportion of nonconsumers for taxed beverages, a two-part probability-amount nonlinear mixed model was fitted [23,24], while a one-part nonlinear mixed model was fitted for untaxed beverages. Standard errors were estimated via bootstrapping, with 200 replications. The primary outcomes of interest were change in calories and grams consumed from taxed beverages, using a two-sided test with statistical significance set at $p < 0.05$. For modeling approach, see S6 Text.

Results

Store price survey prices

Prices of taxed beverages collected in all three time points across large supermarkets showed increases from December 2014 (pre-tax) to June 2015 (1.31¢/oz), which continued for December 2014 to March 2016 (1.07¢/oz). Taxed beverages in small chain supermarkets and gas stations also had price increases from December 2014 to June 2015 (2.20¢/oz) that continued through March 2016 (1.31¢/oz). Price increases were comparatively lower in pharmacies for both intervals (0.90¢/oz and 0.45¢/oz) and were not seen in independent corner stores and gas stations (−0.09¢/oz and −0.64¢/oz) (S3 Table). The difference between prices of taxed and untaxed beverages (cents/ounce) increased in all store types between December 2014 and March 2016, except for beverages sold in independent corner stores and gas stations (Fig 2).

Point-of-sale prices from two supermarket chains

Fig 3 shows the model adjusted sales-unweighted beverage prices in Berkeley and non-Berkeley stores, illustrating the price differential for taxed versus untaxed beverages and change in prices of taxed beverages over time. Among taxed beverages, there were visible price increases in Berkeley stores after January 2015, but it was not until around April 2015 that prices stabilized. Specifically, among the Berkeley stores, taxed beverages had price change of +0.83¢/oz ($p < 0.001$), while this was only +0.16¢/oz ($p < 0.001$) in non-Berkeley stores, for a net difference of +0.67¢/oz ($p < 0.001$). Meanwhile, there were no statistically significant differences in the prices of untaxed beverages between Berkeley and non-Berkeley stores in the post-tax period. Sales-unweighted pass-through was complete among sodas and energy drinks

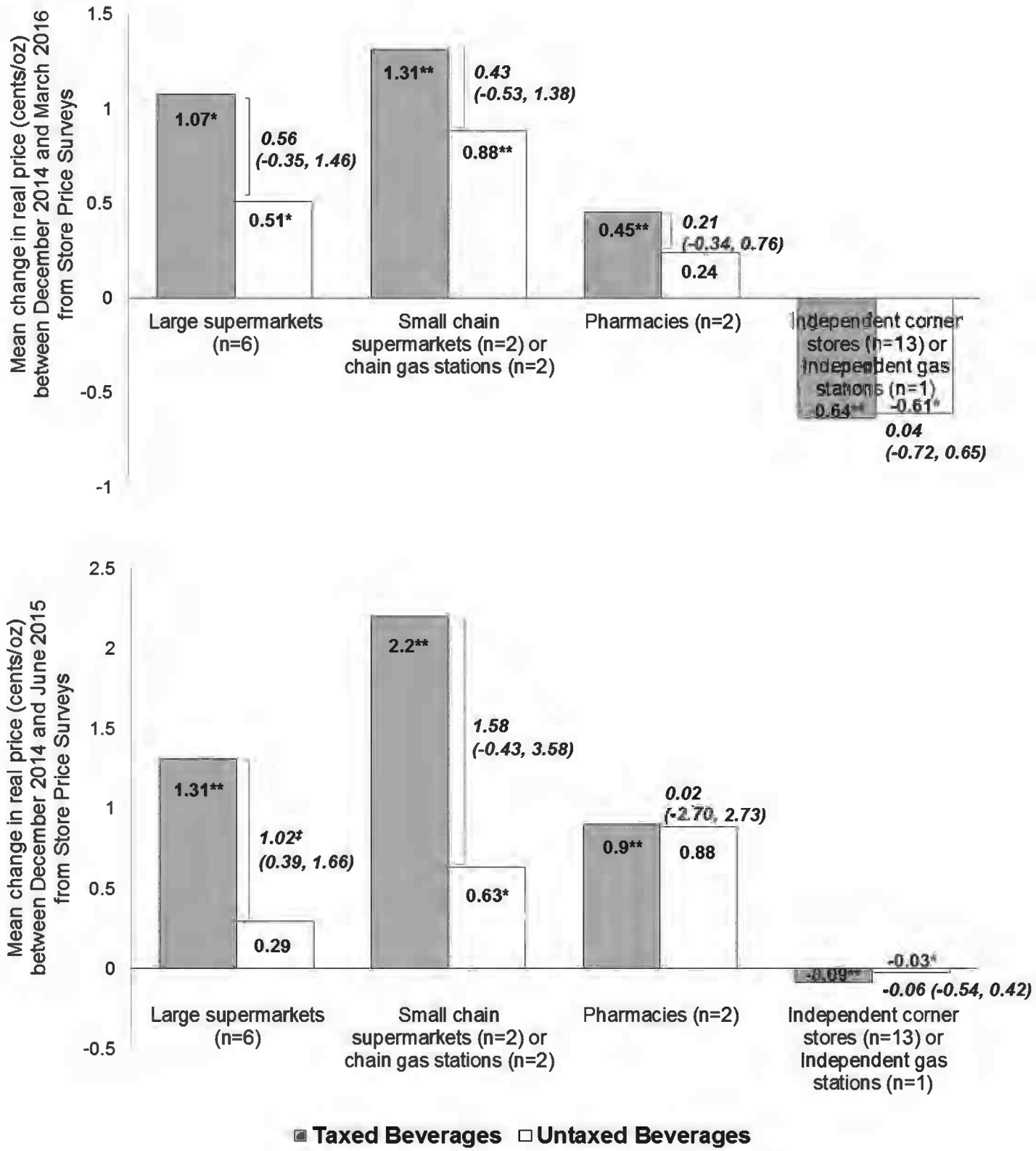


Fig 2. Store price survey mean (95% CI) beverage price changes (cents per ounce) in Berkeley stores. Top: price change between December 2014 (round 1) and March 2016 (round 3). Bottom: price change between December 2014 (round 1) and June 2015 (round 2). Sample limited to 55 product types with 313 prices across stores that were collected in all three rounds of the store price survey; of these, 56% were prices for taxed beverages and 44%

for untaxed beverages. Prices account for inflation. Values in bold italics show the price difference between taxed and untaxed beverages. *Statistically significant difference between prices in later round (March 2016 or June 2015) compared to December 2014 at $p < 0.05$ using paired *t*-tests. **Statistically significant difference between prices in later round (March 2016 or June 2015) compared to December 2014 at $p < 0.01$ using paired *t*-tests. [3] Statistically significant difference of price of taxed beverages compared to untaxed beverages at $p < 0.05$ (unpaired *t*-tests since taxed and untaxed beverage items are different). Source: store price survey data collected by Public Health Institute.

https://doi.org/10.1371/journal.pmed.1002283.g002

(+1.09¢/oz), but incomplete for the other taxed beverage groups (S8 Table). Sales-weighted price changes for taxed beverages was similar, at +0.69¢/oz (S9 Table).

Point-of-sale volume sold in two supermarket chains

The volume of untaxed beverages sold was consistently higher than for taxed beverages in all locations January 2013±February 2016 (Fig 4), and both types of sales were consistently and markedly lower in Berkeley than in comparison stores overall, and most notably in neighboring zone 1 stores, suggesting lower baseline purchasing of SSBs and of beverages in general.

Focusing on the post-tax period, our model adjusted estimates show that compared to their counterfactuals, volume (ounces/transaction) of taxed beverages sold fell significantly by 9.6%

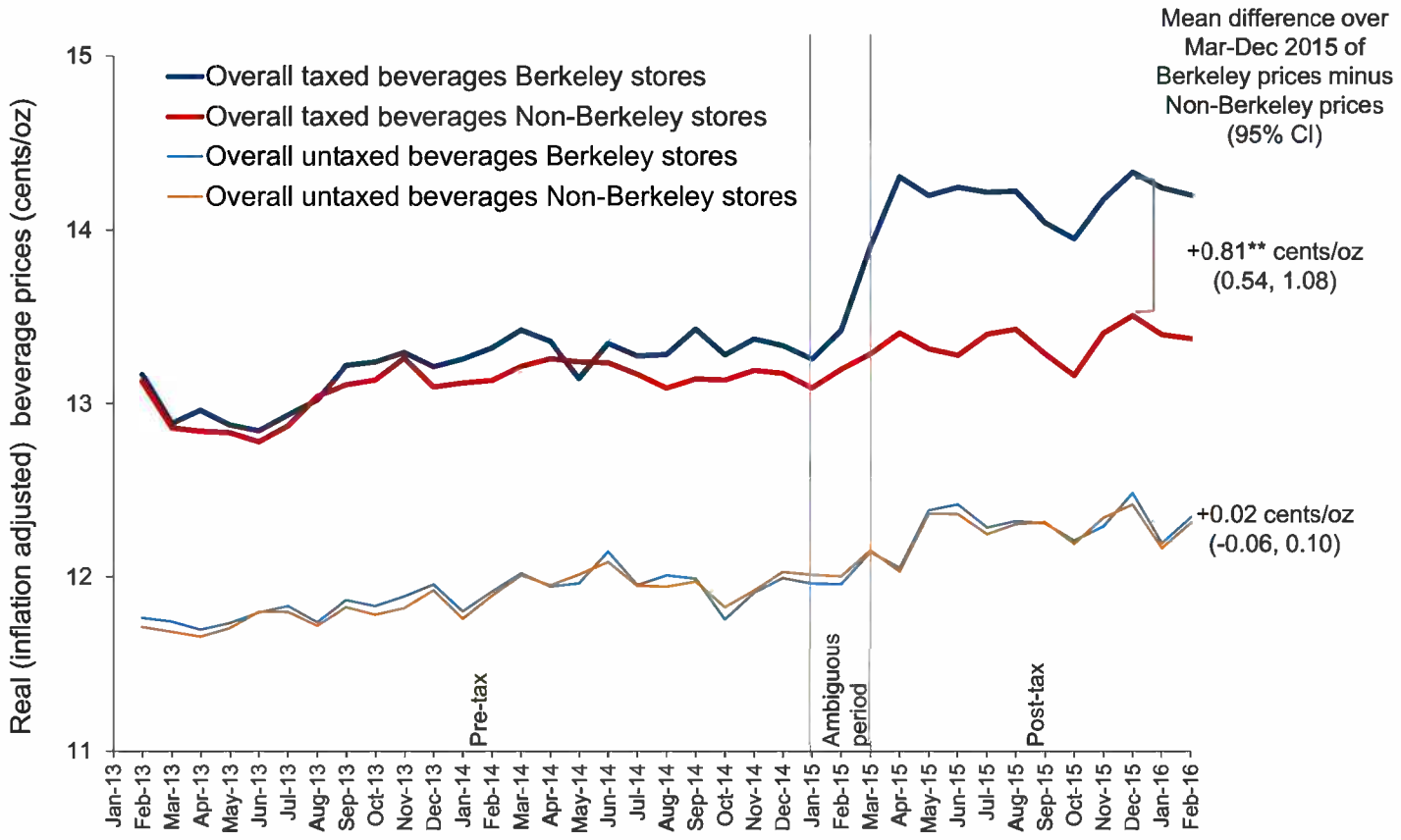


Fig 3. Point-of-sale model adjusted beverage prices (cents per ounce) in Berkeley versus non-Berkeley stores (sales unweighted). Fixed effects models account for the month-year (indicator variables), store located or not located in Berkeley, interaction of Berkeley store and month-year, and an indicator variable of underreported sales data from each store in particular month. Prices account for inflation. Vertical lines demarcate the pre-tax period (January 2013±December 2014), the ambiguous period (January±February 2015), and the post-tax period (March 2015±February 2016). Full sales-unweighted results can be found in S8 Table. Full sales-weighted results can be found in S9 Table. **Statistically significant difference between the Berkeley and non-Berkeley prices for March±December 2015 at $p < 0.01$. Source: point-of-sale data from two chains of large supermarkets in the Bay Area obtained by the Public Health Institute.

https://doi.org/10.1371/journal.pmed.1002283.g003

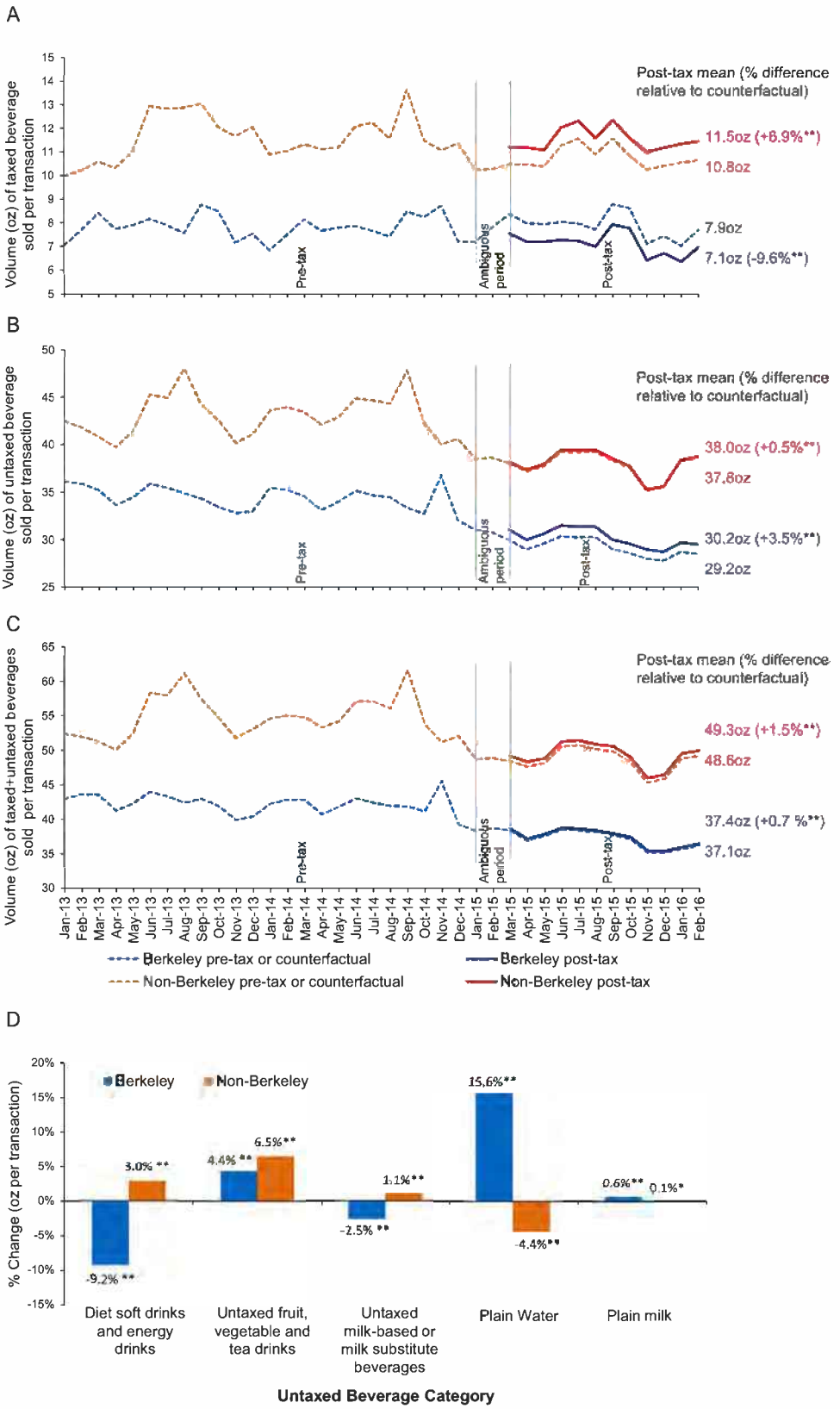


Fig 4. Point-of-sale adjusted mean daily volume of beverages sold (ounces per transaction) in Berkeley versus non-Berkeley stores. (A) Point-of-sale taxed beverage volume sold (ounces per

transaction).(B) Point-of-sale untaxed beverage volume sold (ounces per transaction).(C) Point-of-sale taxed and untaxed beverage volume sold (ounces per transaction).(D) Percent change in post-tax untaxed beverage sales (ounces per transaction) in relation to counterfactual in Berkeley and non-Berkeley stores. Models account for store ID, month, year, day of week, holiday and holiday eve, number of transactions (linear and quadratic), a post-tax indicator, and interactions of store ID with the post-tax indicator, month, and year variables, correcting the standard errors by clustering the analyses at the city level. Back-transformation uses Duan smearing. Model n = 10,152. Vertical lines demarcate the pre-tax period (January 2013±December 2014), the ambiguous period (January±February 2015), and the post-tax period (March 2015±February 2016). To derive the counterfactuals, we predicted the volume of taxed and untaxed beverages sold if the post-tax indicator = 0 for March 2015±February 2016. Full results can be found in S10 and S11 Tables. *Statistically significant difference between the counterfactual and observed volumes sold during the entire post-tax period at $p < 0.05$. **Statistically significant difference between the counterfactual and observed volumes sold during the entire post-tax period at $p < 0.01$. Source: point-of-sale data from two chains of large supermarkets in the Bay Area obtained by the Public Health Institute.

https://doi.org/10.1371/journal.pmed.1002283.g004

in Berkeley stores, but rose by 6.9% in non-Berkeley stores (Fig 4A), sales of untaxed beverages rose by 3.5% in Berkeley stores and 0.5% in non-Berkeley stores (Fig 4B), and sales of all study beverages increased by 0.7% and 1.5% in Berkeley and non-Berkeley stores, respectively (Fig 4C). In Berkeley, sales of untaxed water rose by 15.6%; untaxed fruit, vegetable, and tea drinks, by 4.37%; and plain milk, by 0.63%. Sales of diet soft drinks and energy drinks declined by 9.2% compared to their counterfactuals (Fig 4D).

S10 Table provides the absolute (ounces/transaction) and relative (percent) differences between the counterfactual and post-tax monthly beverage sales in Berkeley versus non-Berkeley stores overall and in the three non-Berkeley zones. Neighboring non-Berkeley stores (zone 1) had the highest increase in sales of taxed and untaxed beverages, whereas sales of taxed beverages declined in more distant zone 3. S11 Table shows the results by untaxed beverage category for Berkeley versus non-Berkeley stores.

Point-of-sale store revenue (consumer spending) per transaction in two supermarket chains

Over the first year of the SSB tax, across both comparison and Berkeley stores, there was a small reduction in revenue in CPI-adjusted dollars per transaction from all sources (not just beverages). Mean store revenue per transaction fell by 18¢ less in Berkeley stores (−$0.36, $p <$ 0.001) compared to non-Berkeley stores (−$0.54, $p < 0.001$) (see Fig 5).

Usual intake of beverages from self-reports

At baseline (November±December 2014), 649 of 3,721 eligible and contactable Berkeley residents age ≥18 y participated (17.4% cooperation), of whom 253 completed a second 24-h beverage recall. At follow-up (November±December 2015), 654 Berkeley residents participated, and 462 completed a second 24-h beverage recall; 346 (53.3%) of the 2015 respondents had completed the baseline survey. After exclusion due to missing values on self-reported race/ethnicity, age, education, income, and monthly intake of SSBs, the final analytic sample included 623 at baseline and 613 at follow-up.

S12 Table provides details on beverage subcategories by tax status and percent consumers within subcategory before and after the tax. The Berkeley sample had lower per capita and per consumer mean caloric intake from both taxed and untaxed beverages relative to the general US population (S13 Table). At baseline, 29% of the Berkeley sample consumed SSBs, substantially below the 58% of consumers in the US population estimated in the National Health and Nutrition Examination Survey. Daily usual taxed beverage intake was 121 g/d pre-tax and 97 g/d post-tax (−13.3%, $p = 0.49$), while mean caloric intake of taxed beverages went from 45

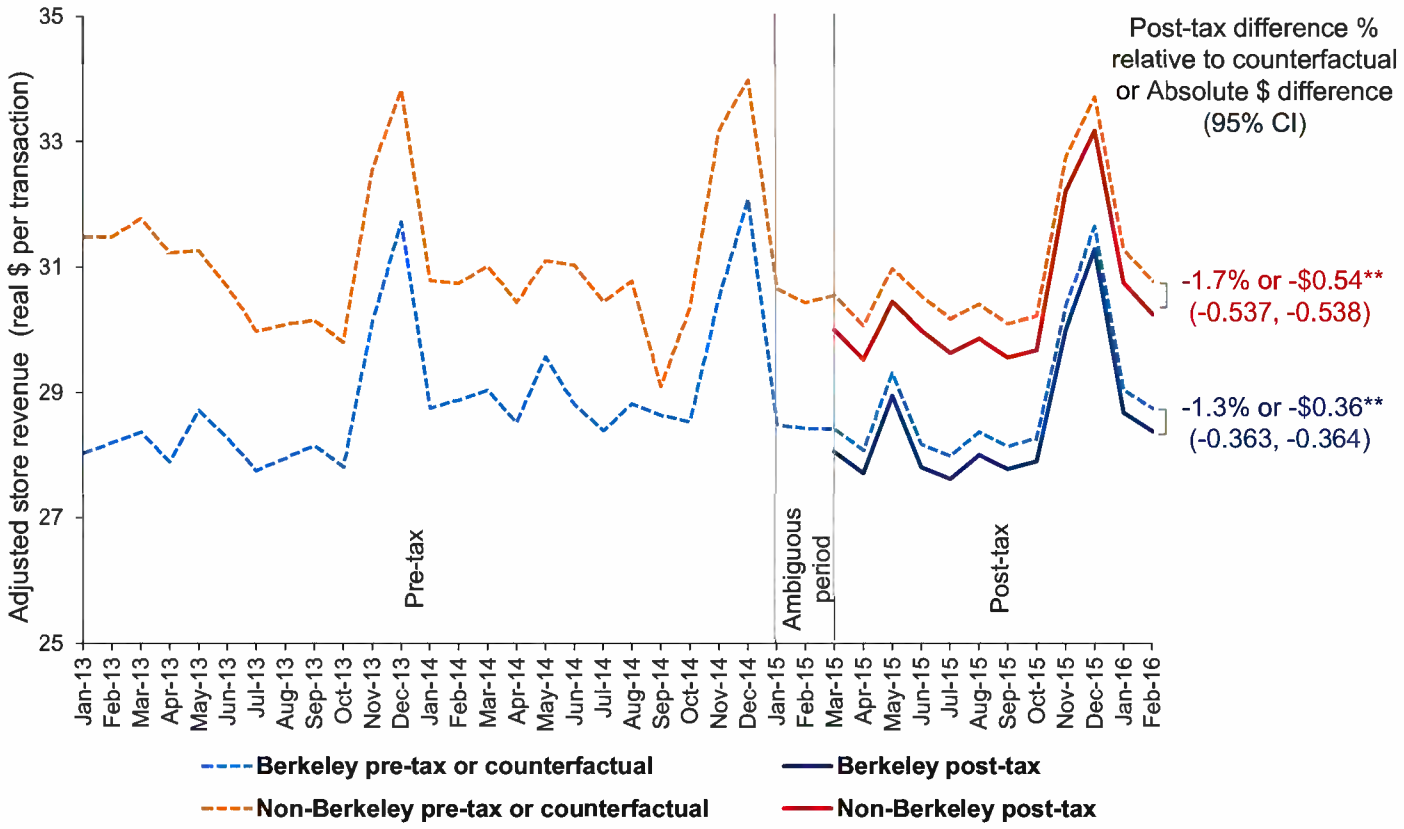


Fig 5. Point-of-sale adjusted mean store revenue/consumer spending (dollars per transaction) in Berkeley versus non-Berkeley stores. Models account for store ID, month, year, day of week, holiday and holiday eve, a post-tax indicator, and interactions of store ID with the post-tax indicator, month, and year variables, correcting the standard errors by clustering the analyses at the city level. Revenues account for inflation. Vertical lines demarcate the pre-tax period (January 2013±December 2014), the ambiguous period (January±February 2015), and the post-tax period (March 2015±February 2016). To derive the counterfactuals, we predicted the volume of taxed and untaxed beverages sold if the post-tax indicator = 0 in March 2015±February 2016. **Statistically significant difference between the Berkeley and non-Berkeley store revenues during the post-tax period at $p < 0.01$. Source: point-of-sale data from two chains of large supermarkets in the Bay Area obtained by the Public Health Institute.

https://doi.org/10.1371/journal.pmed.1002283.g005

kcal/d to 39 kcal/d (−19.8%, $p = 0.56$) (Table 1); neither difference is statistically significant. From the pre- to post-tax period, mean volume of untaxed beverage intake went from 1,839 g/d to 1,897 g/d (+3.2%, $p = 0.21$). Reported mean caloric intake of untaxed beverages rose from 116 kcal/d to 148 kcal/d (+27.6%, $p = 0.02$). The increase in untaxed calories appeared to be mainly from increased milk intake and also ªotherº beverages (which included dairy-based beverages such as yogurt smoothies and milkshakes). Neither juice nor diet soda intake increased. There was no significant change in reported beverage shopping location: ªin Berkeleyº was 90% at baseline versus 94% at follow-up ($p = 0.17$).

Discussion

A year following SSB tax implementation in Berkeley, California, there was heterogeneous pass-through of Berkeley's SSB excise tax across store and beverage types. SSB sales in Berkeley fell significantly in two chains of large supermarkets, while sales of untaxed beverages, especially water, and of all beverages increased. From the available data, there was no evidence of higher consumer spending, nor was there a greater reduction in store revenue per transaction in relation to comparison sites. Changes in self-reported SSB intake were not statistically significant.

Table 1. Usual intake (kilocalories/capita/day and grams/capita/day) of beverages among adult residents of Berkeley, California, pre- and post-tax.

Usual intake	Pre-tax (Nov.±Dec. 2014), *n* = 623		Post-tax (Nov.±Dec. 2015), *n* = 613		Pre-tax±post-tax difference
	Mean	95% CI	Mean	95% CI	
Caloric intake (kilocalories/per capita/day)					
Taxed beverages	45.1	29.4, 60.7	38.7	23.0, 54.4	−6.4, $p = 0.56$
Untaxed beverages	115.7	87.6, 142.5	147.6	116.3, 178.9	31.9*, $p = 0.04$
Volume of intake (grams/capita/day)					
Taxed beverages	121.0	78.7, 163.3	97.0	56.6, 137.4	−24.0, $p = 0.24$
Untaxed beverages	1,839.4	1,692.7, 1,986.1	1,896.5	1,742.3, 2,050.8	57.1, $p = 0.22$

Models account for age, gender, race/ethnicity, income level, and educational attainment. *n* is the sample size at each round of the survey after excluding participants with missing values on self-reported race/ethnicity, age, education, income, or monthly intake of sugar-sweetened beverages.

*Statistically signi®cart difference in mean per capita intake between pre-tax and post-tax values, $p < 0.05$.

Source: dietary and shopping behavior surveys collected by the Public Health Institute.

https://doi.org/10.1371/journal.pmed.1002283.t001

For taxes to directly affect consumption, beverage distributors (upon whom the tax is levied) have to pass the tax on to retailers, and retailers likewise need to pass the tax on to consumers. Tax pass-through in the store price survey was predominant in larger and chain stores but varied in degree and implementation speed by store type, possibly reflecting delayed implementation for [a]self-distributing[o] stores. Focusing on large supermarkets, scanner data from two chains showed that the tax was partially passed through for SSBs and that pass-through varied across SSB types, being highest for carbonated beverages. This may have been due to confusion on what products were taxed, and how distributors and retailers responded to the tax based on market shares of their beverages. These findings resemble findings in Mexico [10] and France [25], where pass-through was complete on carbonated SSBs and lower on noncarbonated products. Falbe et al. [26] examined pass-through in Berkeley and comparison cities in the first 3 months post-tax, with similar findings. Cawley and Frisvold [27] examined pass-though also after only 3 months of the taxÐ9 months prior to full implementation of the tax in small retailersÐand for a smaller panel of products (five products in several sizes each), and found lower pass-through then Falbe et al.; however, they did not have an adequate sample size of small non-chain stores [27]. The present study examined a larger group of beverage products over a full year, including the second stage of tax implementation in the third store price survey. Pass-through may still evolve, as some price changes emerged later in the year. Consumers also saw greater price differentials between taxed and untaxed beverages across all store types. Jurisdictions may wish to include recommendations to retailers in future policies to pass through the tax to SSBs. Cook County, Illinois, included a requirement to do so in their measure [28].

Despite incomplete pass-through of the SSB tax in the two chains of large supermarkets, the volume of SSBs sold fell by 9.6% in Berkeley stores. The volume of beverages sold per transaction as a whole rose in Berkeley, and shopping location did not change. This study was also unique in permitting examination of overall consumer spending at the stores studied, which did not increase, a concern widely cited by opponents of SSB taxes [29]. This study found that consumer spending, measured as store revenue per transaction, declined slightly, falling less in Berkeley stores than in comparison stores, despite increasing overall beverage sales in Berkeley. This appears to belie, at least in the chains studied, beverage industry arguments that such policies will raise grocery bills in general or that they will hurt local business. The volume of SSBs bought in stores nearest to Berkeley rose, consistent with either potential shifts to buying SSBs outside Berkeley (not reported in the telephone survey) or increasing consumption by

residents of the non-Berkeley cities, as found by Falbe et al. [30]. When taxes are implemented in very small geographical areas such as Berkeley, shifts in shopping location may be a greater risk. Recent approval of similar policies in three neighboring cities may reduce or displace any shifting. Since Berkeley has on average higher education and median income and lower baseline SSB consumption compared to the US in general, it was unclear whether the tax would be high enough to change demand. In Berkeley, the post-tax sales of SSBs declined to a greater degree than in Mexico, where the decline was 6% over the first year, and this decline is consistent with earlier estimates that a 10% increase in soft drink prices would reduce consumption by 8%±12% [31,32]. The decline may be due to concomitant high rates of residents in poverty.

Using a 3- to 10-min street intercept survey of low-income residents in Berkeley and control cities, Falbe et al. found a significant 21% decline in the frequency of SSB intake in Berkeley [30]. Our telephone study used calories and grams of reported intake rather than frequency; our finding on change in mean daily SSB intake across the general population lacked statistical significance, although it was of similar magnitude to that found by Falbe et al., with a 19.8% reduction in grams. Falbe et al. examined only water consumption for untaxed beverages [30], while the present study asked about most untaxed beverages. The higher calories from untaxed beverages in our self-reported post-tax survey came predominantly from two sources: milks and ªotherº untaxed beverages, which included higher-fat beverages such as yogurt smoothies, milkshakes, atole, horchata, and eggnog. These findings contrast with the substitution pattern seen in our Berkeley point-of-sale data, which showed an increase in water sales and smaller but still significant increases in sales of plain milk and untaxed fruit, vegetable, and tea drinks, as well as a significant decline in untaxed diet drinks. Prior evidence suggests that when individuals substitute beverages in the wake of increased SSB prices, they are likely to choose water or diet soft drinks or fruit drinks [33], of which only fruit drinks would add calories. Our point-of-sale data are consistent with regard to increases in sales of water, and possibly fruit drinks, but not diet drinks. Since the point-of-sale data do not show that sales of these ªotherº untaxed beverages rose meaningfully, perhaps there was an increase in the intake of these beverages at home (prepared from fruit and plain yogurts or milks) or at food-service locations. It is unclear whether consumption changes can be attributed to the tax, and we do not want to speculate since the self-reported beverage intake component of our study did not sample non-Berkeley residents, so we are unable to tell if the increase in the self-reported intake of ªotherº untaxed beverages was a secular trend or specific to Berkeley. Nonetheless, our results are consistent with Falbe et al.'s findings of small increases for frequency of SSB intake in control communities, no change in location of SSB shopping, and an increase in frequency of water intake in Berkeley [30].

In this comparatively low-SSB-consuming city, the city's tax revenue over the first year of the SSB tax was $1,416,973 (approximately $12 per capita) [34], roughly four times the 2015 per capita amount in the federal Prevention and Public Health Fund. Proceeds are being used for child nutrition and community health programs [35]. This suggests that SSB taxes can provide significant revenue for prevention or other societal goals.

Limitations

This observational study cannot establish causal links between the SSB tax implementation and changes in measured outcomes, nor did it assess health outcomes. It cannot distinguish the longer-term effects of education and intensive media debate on SSBs in the communities surrounding the San Francisco Bay as a result of tax and other preexisting campaigns in both Berkeley and San Francisco in 2014, although, in contrast to Falbe et al.'s work, baseline store price survey and consumption data were collected after those campaigns but before tax

implementation, mitigating this issue somewhat. Our selection of comparison sites used cities that had been exposed to similar educational campaigns and to the Bay Area tax media campaigns (both for and against), so that the difference-in-difference analysis more purely reflects the effects of the tax itself. The alternative of a more distant control would have better captured the combined effects of the campaigns and the tax itself.

This study also cannot clarify whether distributors, retailers, and/or consumers altered their behaviors in anticipation of the SSB tax or to what degree changes in these various parties' behaviors were associated with changes in prices and sales. The 26-store survey sample was less representative of small and independent stores than of larger groceries. Analysis of consumption was limited by the small effect size in relation to high standard error and Berkeley's low baseline consumption, leading to an underpowered sample, and by the absence of a comparison community, suggesting the need for a larger, controlled sample, optimally with higher SSB consumption, more reflective of national consumption patterns. Obtaining such a sample in Berkeley proved unfeasible using the random digit dialing approach and available resources in the time-sensitive 6-wk window between passage of the tax and the original implementation date of 1 January 2015, when baseline survey data were collected.

Despite the large number of transactions, while many grocers were invited, scanner data were limited to two chains of large supermarkets and are not generalizable to all stores or store types. Independently owned small corner stores, in particular, are very different, did not exhibit price changes in our data, and may not have reliable records on their sales. Consequently, Berkeley consumers may have shifted their SSB purchases to independent stores, but our data are unable to determine this. The differential pass-through also warrants further investigation. However, in separate descriptive analyses of food purchases for the Bay Area from the 2014 Nielsen Homescan data [36,37], about 50% of the volume of beverages purchased is from chain groceries (with $\geq$10 locations nationwide), and only about 2% from independent stores ($<$10 locations nationally) (per our own calculations) [36]. For this reason, chain groceries likely constitute the most significant consumer SSB purchasing setting.

Strengths of this study include an intimate understanding of the local implementation process, the ability to sample large and small stores and chains, and the large volume of transactions studied. These strengths allow us to begin learning where and to what degree the tax was implemented as well as to observe changes in prices, volume sold, and store revenue.

Conclusions

These findings suggest that implementing a SSB excise tax was feasible and SSB sales fell concomitantly, while the tax captured revenue for obesity prevention and other societal goals. Whether observed changes in sales were related to enactment of the tax or other local activities cannot be definitively determined due to the observational design. However, the observation of price increases for SSBs in two distinct data sources, the timing of those increases, and the patterns of change in taxed and untaxed beverage sales suggest that the observed changes may be attributable to the tax. Assessment of newly approved SSB taxes in a number of other cities/counties in the US at 1±2¢/oz will be important, and associations of taxation with substitutions in beverage sales and intake should be further assessed in settings with more typical consumption and using larger samples.

Supporting information

S1 Fig. Point-of-sale mean monthly unadjusted sales (ounces/transaction) of beverages in Berkeley versus non-Berkeley stores.
(DOCX)

S1 STROBE. STROBE checklist for observational studies.
(DOCX)

S1 Table. Panel of 70 beverage items by beverage and taxation categories collected in the store price surveys conducted in December 2014, June 2015, and March 2016.
(DOCX)

S2 Table. Number of prices collected across all stores for the standard panel of 70 beverages in the store price surveys, by store and beverage type.
(DOCX)

S3 Table. Mean (95% CI) store price survey change in beverage prices (cents/ounce) by store type in Berkeley that were collected in all three rounds.
(DOCX)

S4 Table. Mean (standard error) store price survey change in beverage prices (cents/ounce) by store type in Berkeley based on paired comparisons.
(DOCX)

S5 Table. Neighborhood characteristics of Berkeley and non-Berkeley grocery stores providing scanner data. American Community Survey 5-y estimates (2009±2013).
(DOCX)

S6 Table. Number of barcode scans, unique barcodes, and transactions included in the point-of-sale study.
(DOCX)

S7 Table. Beverages included and excluded from point-of-sale study.
(DOCX)

S8 Table. Point-of-sale mean (95% CI) sales-unweighted differences in beverage prices (cents/ounce) in Berkeley versus non-Berkeley stores by beverage group from fixed effects models.
(DOCX)

S9 Table. Point-of-sale mean (95% CI) sales-weighted differences in beverage prices (cents/ounce) in Berkeley versus non-Berkeley stores by beverage group from fixed effects models.
(DOCX)

S10 Table. Point-of-sale model adjusted monthly counterfactuals and observed sales of beverages in Berkeley versus non-Berkeley stores, and mean absolute (ounces/transaction) and relative (percent of counterfactual) differences. CF, counterfactual; NB, non-Berkeley.
(DOCX)

S11 Table. Point-of-sale model adjusted counterfactuals and observed sales of untaxed beverage categories in Berkeley versus non-Berkeley stores, and mean absolute (ounces/transaction) and relative (percent of counterfactual) differences. CF, counterfactual; NB, non-Berkeley.
(DOCX)

S12 Table. Weighted frequency of reported consumption rates of taxed and untaxed beverages by subcategory pre- and post-tax, Berkeley, California, 2014±2015.
(DOCX)

S13 Table. Descriptive statistics of Berkeley sample in 2014 and 2015 compared to adult sample (age 18 y and older) in the National Health and Nutrition Examination Survey, 2011±2012.
(DOCX)

S1 Text. Details on the store price survey sample design, data collection procedures, and price analysis.
(DOCX)

S2 Text. Details on the point-of-sale data and price, volume sold, and store revenue analyses.
(DOCX)

S3 Text. Point-of-sale price fixed effects models and predictions.
(DOCX)

S4 Text. Point-of-sale volume sold difference-in-difference models and predicted outcomes.
(DOCX)

S5 Text. Details on the dietary and shopping behavior survey.
(DOCX)

S6 Text. Usual intake modeling approach.
(DOCX)

S7 Text. References for supporting information.
(DOCX)

Acknowledgments

We thank Cory Hamma (Microsoft Certified IT Professional) and Scott Riddle in helping secure and manage the retailer data; Julie Wandell and Emily Yoon, who were invaluable in helping with the beverage groupings and tax classification work; Frances Dancy for administrative and formatting help; Denise Ammons for graphics support; the team from the Survey Research Group at Public Health Institute for data collection and entry work; and the respondents and stores that generously participated, especially those that generously shared their data.

Author Contributions

Conceptualization: LDS SWN SRI MI LST BMP.

Data curation: LDS SRI MI DRM JMP SRI.

Formal analysis: SWN DRM LST SRI.

Funding acquisition: BMP.

Investigation: LDS SWN SRI MI LST DRM JMP MI BMP.

Methodology: LDS SWN SRI MI LST BMP DRM.

Project administration: LDS BMP.

Resources: LDS BMP.

Software: SWN DRM JMP SRI LST.

Supervision: LDS BMP.

Validation: LDS SWN BMP.

Visualization: LDS SWN SRI LST.

Writing ± original draft: SWN LDS SRI LST BMP.

Writing ± review & editing: LDS SWN SRI MI LST DRM JMP MI BMP.

References

1. World Health Organization. Guideline: sugars intake for adults and children. Geneva: World Health Organization; 2015.
2. Malik VS, Popkin BM, Bray GA, Despres JP, Willett WC, Hu FB. Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. Diabetes Care. 2010; 33(11):2477±83. https://doi.org/10.2337/dc10-1079 PMID: 20693348
3. Brownell KD, Farley T, Willett WC, Popkin BM, Chaloupka FJ, Thompson JW, et al. The public health and economic benefits of taxing sugar-sweetened beverages. N Engl J Med. 2009; 361(16):1599±605. https://doi.org/10.1056/NEJMhpr0905723 PMID: 19759377
4. Andreyeva T, Chaloupka FJ, Brownell KD. Estimating the potential of taxes on sugar-sweetened beverages to reduce consumption and generate revenue. Prev Med. 2011; 52(6):413±6. https://doi.org/10.1016/j.ypmed.2011.03.013 PMID: 21443899
5. Wang YC, Coxson P, Shen Y, Goldman L, Bibbins-Domingo K. A penny-per-ounce tax on sugar-sweetened beverages would cut health and cost burdens of diabetes. Health Aff (Millwood). 2012; 31(1):199±207.
6. Popkin BM, Hawkes C. Sweetening of the global diet, particularly beverages: patterns, trends, and policy responses. Lancet Diabetes Endocrinol. 2016; 4(2):174±86. https://doi.org/10.1016/S2213-8587(15)00419-2 PMID: 26654575
7. Long MW, Gortmaker SL, Ward ZJ, Resch SC, Moodie ML, Sacks G, et al. Cost effectiveness of a sugar-sweetened beverage excise tax in the U.S. Am J Prev Med. 2015; 49(1):112±23. https://doi.org/10.1016/j.amepre.2015.03.004 PMID: 26094232
8. Chriqui JF, Chaloupka FJ, Powell LM, Eidson SS. A typology of beverage taxation: multiple approaches for obesity prevention and obesity prevention-related revenue generation. J Public Health Policy. 2013; 34(3):403±23. https://doi.org/10.1057/jphp.2013.17 PMID: 23698157
9. Colchero MA, Popkin BM, Rivera JA, Ng SW. Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study. BMJ. 2016; 352:h6704. https://doi.org/10.1136/bmj.h6704 PMID: 26738745
10. Colchero MA, Salgado JC, Unar-Munguâ M, Molina M, Ng S, Rivera-Dommarco JA. Changes in prices after an excise tax to sweetened sugar beverages was implemented in Mexico: evidence from urban areas. PLoS ONE. 2015; 10(12):e0144408. https://doi.org/10.1371/journal.pone.0144408 PMID: 26675166
11. City of Berkeley. Frequently asked questions (FAQ) for the sweetened beverage tax of Berkeley, CA. Berkeley (California): City of Berkeley; 2016 Jan 4 [cited 2017 Mar 14]. Available from: http://www.ci.berkeley.ca.us/uploadedFiles/Finance/Level_3_-_General/Frequently%20Asked%20Questions%20Edited%20Version%20111015.2.pdf.
12. United States Census Bureau. QuickFacts: United States. Washington (District of Columbia): United States Census Bureau; 2017 [cited 2017 Jan 15]. Available from: http://www.census.gov/quickfacts.
13. City of Berkeley. Imposing a general tax on the distribution of sugar-sweetened beverage products. Berkeley (California): City of Berkeley; 2014 [cited 2017 Jan 15]. Available from: http://www.cityofberkeley.info/uploadedFiles/Clerk/Elections/Sugar%20Sweeetened%20Beverage%20Tax%20%20-%20Full%20Text.pdf.
14. Mintel. GNPD±Global New Product Database. London: Mintel; 2017 [cited 2017 Jan 15]. Available from: http://www.mintel.com/gnpd.
15. California Department of Public Health. Background on CDPS. Sacramento: California Department of Public Health; 2013 [cited 2017 Jan 15]. Available from: https://www.cdph.ca.gov/programs/cpns/Documents/CDPSBackground2013.pdf.

16. Izrael D, Hoaglin D, Battaglia M. A SAS macro for balancing a weighted sample. In: Proceedings of the Twenty-Fifth Annual SAS Users Group International Conference. Cary (North Carolina): SAS Institute; 2000 [cited 2017 Mar 23]. Available from: http://www2.sas.com/proceedings/sugi25/25/st/25p258.pdf.
17. Agricultural Research Service. Welcome to the USDA Food Composition Databases: National Nutrient Database for Standard Reference. Washington (District of Columbia): United States Department of Agriculture; 2014 [cited 2017 Jan 5]. Available from: https://ndb.nal.usda.gov/ndb/.
18. Agricultural Research Service. Food and Nutrient Database for Dietary Studies. Version 4.1. Washington (District of Columbia): United States Department of Agriculture; 2010.
19. Bureau of Labor Statistics. CPI databases. Washington (District of Columbia): Bureau of Labor Statistics; 2017 [cited 2017 Jan 15]. Available from: http://www.bls.gov/cpi/#data.
20. StataCorp. Stata. Release 13. College Station (Texas): StataCorp; 2014.
21. Tooze JA, Midthune D, Dodd KW, Freedman LS, Krebs-Smith SM, Subar AF, et al. A new statistical method for estimating the usual intake of episodically consumed foods with application to their distribution. J Am Diet Assoc. 2006; 106(10):1575±87. https://doi.org/10.1016/j.jada.2006.07.003 PMID: 17000190
22. Tooze JA, Kipnis V, Buckman DW, Carroll RJ, Freedman LS, Guenther PM, et al. A mixed-effects model approach for estimating the distribution of usual intake of nutrients: the NCI method. Stat Med. 2010; 29(27):2857±68. https://doi.org/10.1002/sim.4063 PMID: 20862656
23. Haines PS, Popkin BM, Guilkey DK. Modeling food consumption decisions as a two-step process. Am J Agr Econ. 1988; 70(3):543±52.
24. Belotti F, Deb P, Manning WG, Norton EC. twopm: two-part models. Stata J. 2015; 15(1):3±20.
25. Berardi N, Sevestre P, Tepaut M, Vigneron A. The impact of a `soda tax' on prices: evidence from French micro data. Banque de France Working Paper No. 415. Rochester (New York): SSRN; 2012 [cited 2017 Jan 15]. Available from: http://ssrn.com/abstract=2192470.
26. Falbe J, Rojas N, Grummon AH, Madsen KA. Higher retail prices of sugar-sweetened beverages 3 months after implementation of an excise tax in Berkeley, California. Am J Public Health. 2015; 105 (11):2194±201. https://doi.org/10.2105/AJPH.2015.302881 PMID: 26444622
27. Cawley J, Frisvold DE. The pass-through of taxes on sugar-sweetened beverages to retail prices: the case of Berkeley, California. J Policy Anal Manag. 2017; 36(2):303±26
28. Board of Commissioners of Cook County Illinois. Legislation details (with text): sweetened beverage tax. Chicago: Board of Commissioners of Cook County; 2016 [cited 2017 Jan 15]. Available from: https://cook-county.legistar.com/ViewReport.ashx?M=R&N=Master&GID=301&ID=2864031&GUID=8DDEE6A8-9125-4556-B93E-9D0D69774C08&Extra=WithText&Title=Legislation+Details+(With+Text).
29. No on HH: No Oakland Grocery Tax. Say ªnoº to an unfair grocery tax in Oakland. Oakland (California): No on HH: No Oakland Grocery Tax; 2016 [cited 2016 Nov 12]. Available from: http://nooaklandgrocerytax.com/.
30. Falbe J, Thompson HR, Becker CM, Rojas N, McCulloch CE, Madsen KA. Impact of the Berkeley excise tax on sugar-sweetened beverage consumption. Am J Public Health. 2016; 106(10):1865±71. https://doi.org/10.2105/AJPH.2016.303362 PMID: 27552267
31. Andreyeva T, Long MW, Brownell KD. The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. Am J Public Health. 2010; 100(2):216±22. https://doi.org/10.2105/AJPH.2008.151415 PMID: 20019319
32. Colchero MA, Salgado JC, Unar-Munguia M, Hernandez-Avila M, Rivera-Dommarco JA. Price elasticity of the demand for sugar sweetened beverages and soft drinks in Mexico. Econ Hum Biol. 2015; 19:129±37. https://doi.org/10.1016/j.ehb.2015.08.007 PMID: 26386463
33. Escobar MAC, Veerman JL, Tollman SM, Bertram MY, Hofman KJ. Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis. BMC Public Health. 2013; 13:1072. https://doi.org/10.1186/1471-2458-13-1072 PMID: 24225016
34. Williams-Ridley D. Sugar sweetened beverage tax revenues. Berkeley (California): City of Berkeley; 2016 May 2 [cited 2017 Mar 21]. Available from: http://www.cityofberkeley.info/uploadedFiles/Clerk/Level_3_-_General/SSB%20Revenues%20050216.pdf.
35. Raguso E. Council approves $1.5M to fight soda consumption. Berkeley (California): Berkeleyside NOSH; 2016 Jan 20 [cited 2017 Jan 15]. Available from: http://www.berkeleyside.com/2016/01/20/berkeley-council-approves-1-5m-to-fight-soda-consumption/.
36. Stern D, Poti JM, Ng SW, Robinson WR, Gordon-Larsen P, Popkin BM. Where people shop is not associated with the nutrient quality of packaged foods for any racial-ethnic group in the United States. Am J Clin Nutr. 2016; 103(4):1125±34. https://doi.org/10.3945/ajcn.115.121806 PMID: 26912495
37. Stern D, Robinson WR, Ng SW, Gordon-Larsen P, Popkin BM. US household food shopping patterns: dynamic shifts since 2000 and socioeconomic predictors. Health Aff (Millwood). 2015; 34(11):1840±8.

EXHIBIT G

Berkeley's Sugar Sweetened Beverage Tax

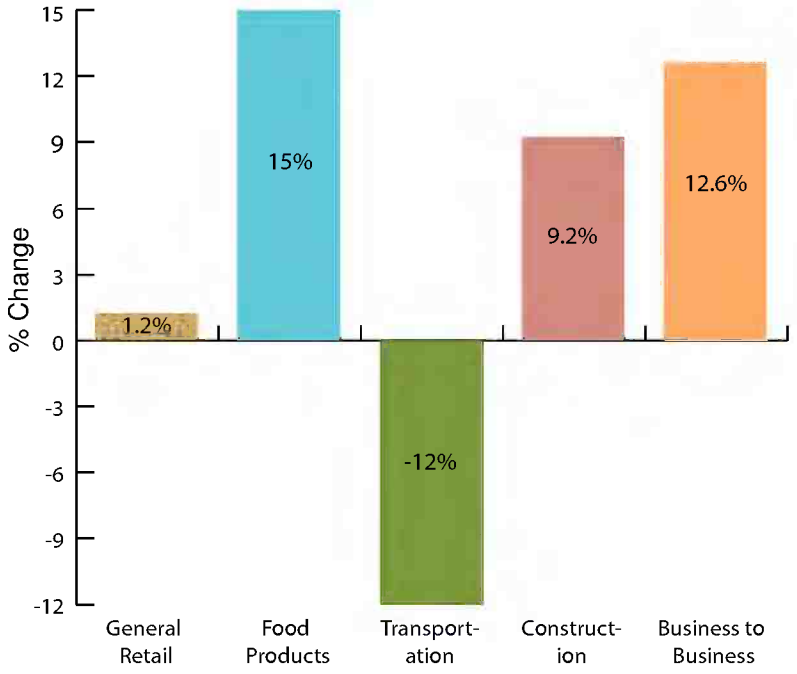
What Happened to Jobs & Business Revenue?

During the 2014 Berkeley campaign to decide whether to approve the nation's first 1¢ per ounce tax on sugar sweetened beverages, and subsequently in other cities and states, tax opponents such as the American Beverage Association alleged that the tax would hurt business or cost jobs. The Public Health Institute's Lynn Silver analyzed data from Berkeley's Office of Economic Development, Muniservices and Employment Development Department.

Two years later, food sector revenue rose by 15% and 469 new food jobs were created—an increase of 7.2%.

Increase in Food Sector Revenue: 15%

Berkeley's business health is reflected in its sales tax revenue, which continued to increase after the tax. The tax became effective March 1, 2015. The greatest rise was precisely in the food products sector where sales tax revenue (this does not include the soda tax) went up 15% between July 2014 and December 2016, more than any other sector. Only about 5% of this increase can be attributed to sales taxes on the value of the soda tax passed through to beverage prices.



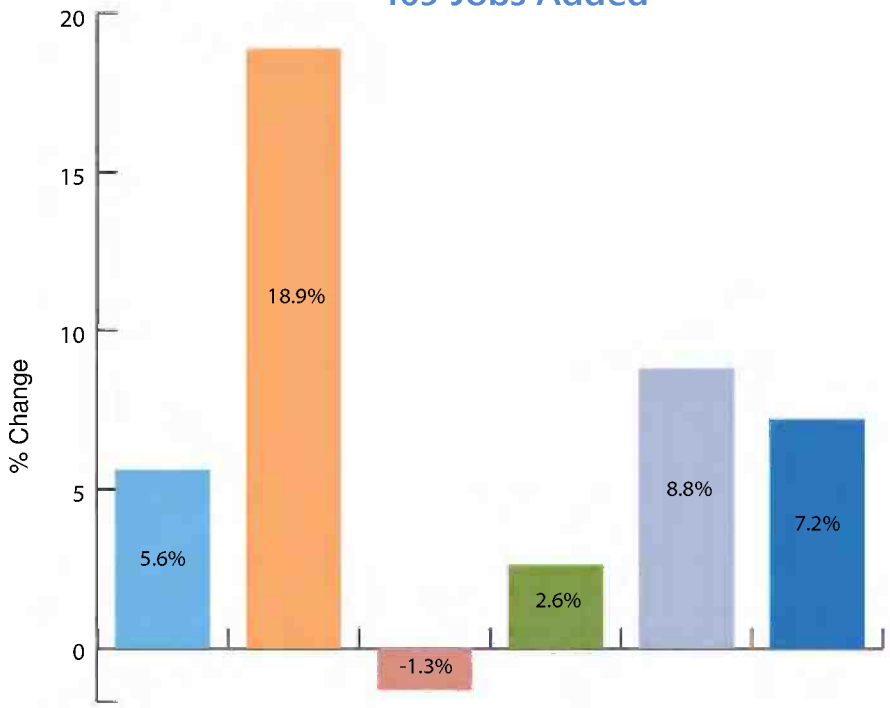
Learn more at **bit.ly/sodataxjobs**

May 2017

Increase in Food Jobs: 7.2%

Similarly, employment across food sector establishments continued to rise overall by 7.2% between April 2014 and June 2016 with 469 jobs added. Employment in limited service restaurants rose by 18.9%, full service restaurants by 5.6%, and in supermarkets and grocery stores by 2.6%—the three largest employer types in the food sector.

469 Jobs Added



	Full Service Restaurants	Limited service Restaurants	Snack and Non-Alcoholic Beverage Bars	Supermarkets and Other Grocery	Gas Station with Convenience Store	All Food Sector
2nd 2014	3046	1362	638	1440	57	6543
2nd 2016	3217	1619	630	1478	62	7012

*Convenience stores increased by 6 but had fewer than 10 jobs in all periods

Learn more at **bit.ly/sodataxjobs**

Berkeley Evaluation of Soda Tax Project – The Public Health Institute NCDHub
Lynn Silver, MD, MPH lsilver@phi.org and team analyzed data provided by the City of Berkeley
Data Source – City of Berkeley, Office of Economic Development, Data sources: Muniservices, and Employment Development Department (EDD) QCEW Data 2014-2016
Thanks to Sandra Garcia, PhD, and Alisa Padon, PhD, at the Public Health Institute

EXHIBIT H

Higher Retail Prices of Sugar-Sweetened Beverages 3 Months After Implementation of an Excise Tax in Berkeley, California

Jennifer Falbe, ScD, MPH, Nadia Rojas, MPH, Anna H. Grummon, BA, and Kristine A. Madsen, MD, MPH

Objectives. We assessed the short-term ability to increase retail prices of the first US 1-cent-per-ounce excise tax on the distribution of sugar-sweetened beverages (SSBs), which was implemented in March 2015 by Berkeley, California.

Methods. In 2014 and 2015, we examined pre- to posttax price changes of SSBs and non-SSBs in a variety of retailers in Berkeley and in the comparison cities Oakland and San Francisco, California. We examined price changes by beverage, brand, size, and retailer type.

Results. For smaller beverages (≤33.8 oz), price increases (cents/oz) in Berkeley relative to those in comparison cities were 0.69 (95% confidence interval [CI] = 0.36, 1.03) for soda, 0.47 (95% CI = 0.08, 0.87) for fruit-flavored beverages, and 0.47 (95% CI = 0.25, 0.69) for SSBs overall. For 2-liter bottles and multipacks of soda, relative price increases were 0.46 (95% CI = 0.03, 0.89) and 0.49 (95% CI = 0.21, 0.77). We observed no relative price increases for nontaxed beverages overall.

Conclusions. Approximately 3 months after the tax was implemented, SSB retail prices increased more in Berkeley than in nearby cities, marking a step in the causal pathway between the tax and reduced SSB consumption. (*Am J Public Health.* 2015;105:2194–2201. doi:10.2105/AJPH.2015.302881)

Consuming sugar-sweetened beverages (SSBs) increases the risk of obesity, diabetes, heart disease, and dental caries[1–4] and has been linked to approximately 184 000 deaths per year worldwide.[5] SSBs are also the largest source of added sugar in the US diet.[6,7] Thus, reducing SSB consumption has been identified as important in preventing obesity and chronic disease.[8–10]

Because of the success of tobacco taxation in reducing smoking prevalence and related diseases,[11] public health experts, including the Institute of Medicine, have recommended taxing SSBs as a means to reduce SSB consumption.[12–15] In 2013 and 2014, more than a dozen states and several cities proposed SSB tax legislation—so called soda taxes.[16] Only 1 proposal passed. On November 4, 2014, Berkeley, California, passed a 1-cent-per-ounce specific excise tax on the distribution of SSBs (Measure D), becoming the first US city to levy such a tax.[17]

Measure D is consistent with the type of tax public health experts have called for—an excise tax on SSBs.[12] Unlike a sales tax, which is added at the register and paid directly by the consumer, an excise tax is levied before the point of purchase (e.g., on distributors). Specific excise taxes are levied per volume of a product, whereas, ad valorem excise taxes are levied as a proportion of product price.[18] In response to an excise tax, distributors are expected to increase SSB prices for retailers, who, in turn, are expected to increase the shelf prices of SSBs paid by consumers. Excise taxes are thought to be more salient to consumers than are sales taxes because they result in higher shelf prices at the point of decision, thus deterring purchase.[12] The effectiveness of an excise tax in reducing SSB consumption hinges partly on its "pass-through rate," or the extent to which the tax is passed on to consumers through higher shelf prices.

In perfectly competitive markets with perfectly inelastic demand (i.e., changing price does not change demand), economic theory predicts perfect pass-through (i.e., a 1-cent excise tax leads to a 1-cent retail price increase).[19,20] However, research suggests that demand for SSBs is elastic[21]; thus, distributors or retailers may undershift the tax (increase prices by <1 cent/oz), either by absorbing the costs or distributing costs across untaxed products (e.g., food or diet soda). In fact, concerns have been raised that businesses might undershift the tax and lower their profit margins to sustain sales (known as "strategic pricing").[22] Undershifting results in lower than expected price increases, potentially undermining the public health benefit of a tax.[23] However, taxes may also be overshifted in monopolistic or oligopolistic markets.[20] Empirically, there is evidence of both over- and undershifting of taxes on cigarettes,[24–29] alcohol,[30,31] and saturated fat.[32] The few empirical studies on SSB excise taxes in other countries have found pass-through rates ranging from about 63% to more than 300%, depending on beverage type, brand, and retailer.[33–35] Because Berkeley's excise tax is the first of its kind in the nation, there is no empirical evidence on how such a tax will be passed-through to consumers in the United States.

We have provided the first early details of the pass-through of Berkeley's excise tax on SSBs. Using neighboring San Francisco and Oakland, California, as comparison cities, we estimated the effect of Berkeley's tax on retail prices of SSBs. Additionally, we examined price changes by beverage, brand, size, and retailer type because research in other countries has found varying pass-through across these variables.

METHODS

To evaluate the pass-through of Berkeley's SSB excise tax, we compared changes in pre- versus posttax beverage prices in Berkeley to changes in beverage prices in the comparison cities Oakland and San Francisco. We selected these cities because of their proximity to Berkeley and their mix of residential and commercial environments. Using a longitudinal

design, we assessed prices of the same beverages in the same stores during pre- and posttax implementation periods.

Measure D levies a tax on the distribution of beverages with added sugar (equivalent to ≥2 kcals/oz), with the exception of milks and beverages for medical use.[36] Alcoholic beverages are exempt, and the tax does not apply to 100% fruit juices, water, or diet beverages without added sugar.[36] Although Measure D specified an implementation date of January 1, 2015, implementation was delayed until the first taxes were collected for March 2015.[37]

The primary outcome was change in beverage price between pre- and posttax periods. We collected pretax prices of most beverages in fall 2014 before the November 4, 2014, election. We collected pretax prices for fruit-flavored beverages and large sizes of soda from November 2014 through January 2015, before implementation. We collected posttax beverage prices from late May through June 2015, approximately 8 months after we collected most pretax data and approximately 3 months after the implementation of the tax. Trained research assistants collected beverage prices by recording visible prices from price tags. For beverages without visible prices, data collectors asked store clerks for prices. If clerks were uncooperative, data collectors purchased beverages and recorded prices from receipts. If a temporary promotional price was advertised, data collectors recorded both the promotional and regular price.

We collected prices for the following SSB categories: soda, energy drinks, sports drinks, sweetened water, presweetened tea, presweetened coffee, and fruit-flavored beverages (not 100% juice). We selected which brands to examine on the basis of industry reports[38,39] of top-selling beverages in the United States as well as researcher observations of commonly sold beverages in the San Francisco Bay Area. For comparison, we collected the prices of untaxed beverages: diet versions, reduced fat milk, water, and 100% orange juice brands from top-selling soda producers. In all stores, we collected prices of sizes typically consumed in a single sitting (e.g., 20-oz sodas) that were most commonly sold in local stores. We collected prices of larger sodas (e.g., 2 L) from a subsample of chain supermarkets and drugstores. Table 1 lists beverage brands and sizes for which we obtained prices.

Sampling was driven by a focus on health disparities. Low-income and minority residents are more likely to consume SSBs and suffer related health consequences[40,41]; thus, in Berkeley and San Francisco, we selected 2 large, low-income neighborhoods with the highest combined proportion of African American and Latino residents.[42] We selected neighborhoods in Oakland using census data to most closely match demographics in the San Francisco and Berkeley neighborhoods. In each neighborhood, we selected the highest foot traffic intersection to facilitate our administration of intercept surveys assessing beverage consumption in each neighborhood (for an ongoing study for which results are not included here).

Average proportions of African American and Latino residents living in the intersections' census tracts were, respectively, 24% and 27% in Berkeley, 28% and 54% in Oakland, and 26% and 43% in San Francisco; citywide percentages were 10% and 11% in Berkeley, 28% and 25% in Oakland, and 6% and 15%

TABLE 1—Beverages: Berkeley, Oakland, and San Francisco, CA; 2014 and 2015

Category	Brand	Size[a]
Regular and diet soda	Coke[b]	20.0 (12.0) oz[e]
	Pepsi[c]	20.0 (12.0) oz[e]
	Mountain Dew[c]	20.0 (12.0) oz[e]
	Dr Pepper[d]	20.0 (12.0) oz[e]
	Sprite[b]	20.0 (12.0) oz[e]
Sports	Gatorade[c]	20.0 (32.0) oz
Energy and diet energy	Red Bull	8.4 oz
Regular and diet sweetened water	Vitamin Water[b]	20.0 oz
Sweetened coffee	Bottled Starbucks Frappuccino[c]	9.5 (13.7) oz
Fruit flavored (not 100% juice)	Arizona	23.0 oz
	Brisk[f]	33.8 (24.0) oz
	Hawaiian Punch[f]	20.0 oz
	Minute Maid fruit drinks[b]	15.2 oz
	Minute Maid lemonade[b]	20.0 oz
	Ocean Spray cranberry juice cocktail	15.2 oz
	Simply lemonade[b]	11.2 oz
	Snapple fruit drinks[d]	16.0 oz
	Sunny Delight	16.0 (11.3) oz
	Sobe elixirs[c]	20.0 oz
	V8 Splash	16.0 oz
Sweetened tea and diet tea	Arizona	23.0 oz
	Snapple[d]	16.0 (20.0) oz
Water	Aquafina[c]	20.0 oz
	Dasani[b]	20.0 oz
100% orange juice	Minute Maid[b]	15.2 oz
	Tropicana[c]	12.0 (15.2) oz
2% milk	Various	14.0 (16.0) oz

[a]Or alternate if main size was not available. This applies to a maximum of 3 stores for each beverage with an alternate size (other than milk). For milk, we collected the alternate size in 5 stores.
[b]The Coca-Cola Company.
[c]PepsiCo.
[d]Dr Pepper Snapple Group.
[e]For exploratory analyses, we also collected prices of regular soda sold in 2-L bottles and 12 packs of 12-oz cans (alternate sizes if 12 packs were not available: 6 packs of 12-oz cans or 6 packs of 16.9-oz bottles).
[f]Pepsi-Lipton Partnership.

in San Francisco.[42] Household median income for the intersections' census tracts versus the city as a whole was $47 000 versus $59 000 in Berkeley, $47 000 versus $50 000 in Oakland, and $50 000 versus $71 000 in San Francisco.[42]

As in previous studies of food environments,[43,44] we identified beverage retailers within a 0.5-mile radius of each intersection. Using a procedure developed by Morland et al.[45] to classify retailers on the basis of the North American Industry Classification System code,[46] we included chain supermarkets, drugstores, small grocery stores, liquor stores, and convenience stores from ReferenceUSA, a commercial business directory.[47] We sampled liquor stores because in the Bay Area they are also destinations for nonalcoholic beverage purchases. We limited drugstores sampled to the 2 chains present in all 3 cities. We also identified and verified retailers through corporate Web sites, Google Maps, Yellow Pages, and field observations. To be eligible, retailers had to stock at least 1 of the 5 top-selling sodas in the United States.[38] We classified retailers not listed in ReferenceUSA by brand recognition, keywords (e.g., liquor), or similarity to other retailers in a category.

We then selected beverage retailers using a random sample stratified by retailer type to achieve a minimum of the following near each intersection: 3 small grocery stores, 2 drugstores, 1 convenience store, and 2 liquor stores. If an insufficient number of retailers in a category were located within a 0.5-mile radius, we sampled the next closest retailer. In Berkeley, we sampled an additional 2 drugstores and 2 small grocery stores to increase power. Additionally, we sampled a store from all eligible chain supermarkets in Berkeley selling 1 of the 5 top-selling sodas (n = 3) and up to 2 supermarkets in those chains in both Oakland and San Francisco. We also intentionally sampled 7-Elevens in each city (n = 2 per city) because of their national prevalence. Finally, if we randomly sampled a chain convenience store (e.g., Shell), we sampled another retailer in the same chain from another city.

This sampling approach captured the stores at which vulnerable populations are likely to shop—walkable stores in the immediate neighborhood—as well as popular chains serving a broader customer base. Table 2 lists numbers of retailers sampled by city and type. In Berkeley, Oakland, and San Francisco, respectively, 14, 11, and 12 stores were chains, and 10, 9, and 9 stores were outside the 0.5-mile radii (the majority of which were chains).

For small grocery, convenience, and liquor stores, we sampled 50% of eligible stores in the selected neighborhoods in Berkeley, 52% in Oakland, and 31% in San Francisco. On the basis of ReferenceUSA-verified lists of retailers with primary North American Industry Classification System codes corresponding to our store definitions,[47] our sample represented 27%, 6%, and 3% of eligible retailers in Berkeley, Oakland, and San Francisco, respectively. However, retailers outside our selected neighborhoods were not researcher verified, so the denominators for citywide retailers (which include stores unlikely to carry top-selling sodas such as health food stores) may underestimate the proportion of relevant retailers sampled.

To examine differences between Berkeley and comparison cities in changes in beverage prices (i.e., pass-through), we regressed the difference between post- and pretax prices on indicators for the presence of the tax and the retailer type. Separate models examined relative price changes for specific beverage categories (regular soda, diet soda, sweetened tea, fruit-flavored beverages, water, milk, and orange juice), and the broader categories of SSBs (regular soda, sweetened tea, sweetened coffee, fruit-flavored beverages, sports drinks, energy drinks, sweetened water) and non-SSBs (water, milk, orange juice, diet versions).

We also examined changes in prices of regular soda relative to diet soda as well as prices of SSBs relative to non-SSBs (i.e., change in SSB price minus change in non-SSB price). In a sensitivity analysis, we examined whether promotional prices affected pass-through rates for soda, fruit-flavored drinks, and SSBs.

We also assessed relative price changes for specific brands and their diet version (when available): Coke, Pepsi, Mountain Dew, Dr Pepper, Sprite, Gatorade, Red Bull, Vitamin Water, and bottled Starbucks Frappuccino.

Lastly, in exploratory analyses (limited by sample size), we used stratified models to examine differences in the pass-through by retailer type. We also examined differences in price changes for larger soda sizes, adjusting for store type. We conducted analyses using Stata/IC version 13 (Stata Corp, College Station, TX).

RESULTS

Table 3 displays unadjusted baseline beverage prices, pre- to posttax changes in prices, and differences in price changes between Berkeley and comparison cities (i.e., pass-through estimates) for beverage sizes typically consumed in a single sitting. The increase in the price of soda in Berkeley over that in comparison cities was 0.69 cents per ounce (95% CI = 0.36, 1.03)—a pass-through rate of 69%. For fruit-flavored beverages, the pass-through was lower—0.47 cents per ounce (95% CI = 0.08, 0.87). For sweetened teas, the pass-through was the lowest: 0.32 cents per ounce (95% CI = 0.00, 0.65). For SSBs overall, the pass-through was 0.47 cents per ounce (95% CI = 0.25, 0.69). For categories of nontaxed

TABLE 2—Analytic Sample of Retailers: Berkeley, Oakland, and San Francisco, CA, 2014 and 2015

Retailer	Berkeley[a]	Oakland[b]	San Francisco[b]
Chain supermarket	3	3	5
Chain 1	1	2	2
Chain 2	1	1	2
Chain 3	1	0	1
Small grocery store	8	6	6
Drugstore	6	4	4
Chain 1	3	2	2
Chain 2	3	2	2
Convenience store	5	5	4
Chain 1	2	2	2
Chain 2	1	1	0
Chain 3	1	1	0
Other	1	1	2
Liquor store	4	4	4
Total	26	22	23

Note. For large sodas (2 L and multipacks), we sampled 3 chain supermarkets and 2 drugstores in Berkeley and 5 chain supermarkets and 4 drugstores in Oakland and San Francisco. This sample includes 1 store per city from each supermarket and drugstore chain sampled.
[a]City with a sugar-sweetened beverage excise tax, implemented March 2015.
[b]Comparison city without a sugar-sweetened beverage excise tax.

TABLE 3—Unadjusted Baseline Beverage Prices, Pre- to Posttax Price Changes, and Price Change Differences: Berkeley, Oakland, and San Francisco, CA, 2014 and 2015

	Taxed City: Berkeley			Comparison Cities: Oakland and San Francisco			
Beverage	No.	Pretax Price, Cents/Oz, Mean ±SD	Price Change, Cents/Oz, Mean ±SD	No.	Pretax Price, Cents/Oz, Mean ±SD	Price Change, Cents/Oz, Mean ±SD	Difference in Change Between Berkeley and Comparison Cities, B (95% CI)[a]
Means of beverages							
Soda	26	8.66 ±1.08	0.78 ±0.64	45	8.69 ±1.07	0.12 ±0.71	0.69*** (0.36, 1.03)
Diet soda	24	8.80 ±0.86	0.40 ±0.49	41	8.66 ±1.13	0.25 ±0.80	0.15 (−0.21, 0.50)
Difference in regular and diet soda	24	0.02 ±0.29	0.41 ±0.63	41	0.05 ±0.49	−0.12 ±0.61	0.56** (0.24, 0.88)
Sweetened tea	21	6.07 ±2.06	0.23 ±0.69	41	6.15 ±1.56	−0.07 ±0.51	0.32* (0.00, 0.65)
Fruit-flavored beverages	21	9.50 ±3.07	0.38 ±0.93	40	8.65 ±1.32	−0.11 ±0.57	0.47* (0.08, 0.87)
Water	12	8.37 ±1.17	0.45 ±0.48	23	7.43 ±1.69	0.31 ±0.60	0.08 (−0.28, 0.45)
Milk	12	10.58 ±1.75	0.15 ±0.54	23	11.14 ±1.75	−0.09 ±1.26	0.22 (−0.60, 1.04)
100% orange juice	16	14.47 ±2.08	0.17 ±0.90	33	13.27 ±1.87	0.28 ±1.61	−0.16 (−1.03, 0.71)
Overall SSBs[b]	26	10.91 ±2.09	0.57 ±0.59	45	10.35 ±1.48	0.14 ±0.40	0.47*** (0.25, 0.69)
Overall non-SSBs[c]	24	12.24 ±2.63	0.29 ±0.74	45	11.39 ±3.12	0.28 ±0.60	0.00 (−0.32, 0.33)
Difference in SSB and non-SSB	24	−0.99 ±2.46	0.29 ±0.75	45	−1.04 ±2.66	−0.14 ±0.62	0.46** (0.13, 0.79)
Brands							
Coke	26	8.71 ±1.27	0.87 ±0.81	44	8.85 ±1.05	0.07 ±0.56	0.83*** (0.50, 1.16)
Diet Coke	22	8.74 ±0.89	0.50 ±0.55	38	8.82 ±1.03	0.18 ±0.52	0.32* (0.02, 0.61)
Pepsi	19	8.90 ±0.91	0.57 ±0.53	41	8.79 ±1.12	0.04 ±0.85	0.55* (0.11, 0.98)
Diet Pepsi	18	8.95 ±0.91	0.24 ±0.34	34	8.89 ±0.94	0.08 ±0.63	0.17 (−0.15, 0.50)
Mountain Dew	19	8.94 ±0.92	0.67 ±0.74	34	8.79 ±1.20	0.04 ±0.79	0.68** (0.24, 1.12)
Diet Mountain Dew	12	9.10 ±0.79	0.13 ±0.20	21	9.05 ±0.79	0.13 ±0.25	0.02 (−0.12, 0.17)
Dr Pepper	20	8.81 ±0.76	0.84 ±0.71	33	8.70 ±1.07	0.25 ±0.86	0.56* (0.11, 1.02)
Diet Dr Pepper	12	8.93 ±0.81	0.35 ±0.57	24	8.94 ±0.81	0.23 ±0.45	0.15 (−0.19, 0.49)
Sprite	21	9.03 ±1.24	0.79 ±0.74	39	8.70 ±1.14	0.16 ±0.84	0.73** (0.31, 1.15)
Sprite Zero	6	9.21 ±0.77	0.21 ±0.25	10	8.54 ±1.65	0.42 ±1.23	−0.50 (−1.66, 0.66)
Gatorade	18	8.32 ±1.04	0.29 ±0.78	29	7.65 ±2.05	0.13 ±0.97	0.19 (−0.39, 0.77)
Vitamin Water	16	9.02 ±0.76	0.43 ±0.52	33	8.69 ±1.86	0.19 ±1.28	0.42 (−0.21, 1.04)
Vitamin Water Zero	9	9.04 ±0.85	0.63 ±0.54	12	8.80 ±0.79	−0.01 ±0.75	0.72* (0.02, 1.41)
Starbucks Frappucino	14	26.08 ±4.87	−0.51 ±1.76	33	24.64 ±4.02	0.32 ±4.00	−1.16 (−3.29, 0.97)
Red Bull	23	28.75 ±2.92	0.68 ±2.88	38	27.26 ±2.70	0.86 ±2.35	−0.27 (−1.64, 1.11)
Red Bull Sugarfree	20	28.50 ±2.64	0.38 ±2.97	32	27.37 ±2.62	1.00 ±2.54	−0.53 (−2.10, 1.04)

Note. CI = confidence interval; SSBs = sugar-sweetened beverages.

[a]Estimate is from linear regression models, adjusting for retailer type in which the dependent variable was price change (posttax price minus pretax price) and the independent variable was a binomial indicator for tax. We collected posttax prices from late May through June 2015, and we collected most pretax prices in fall 2014 (we collected fruit-flavored beverage prices from November 2014 through January 2015). Analyses included sizes typically consumed in a single sitting (e.g., 20-oz soda).

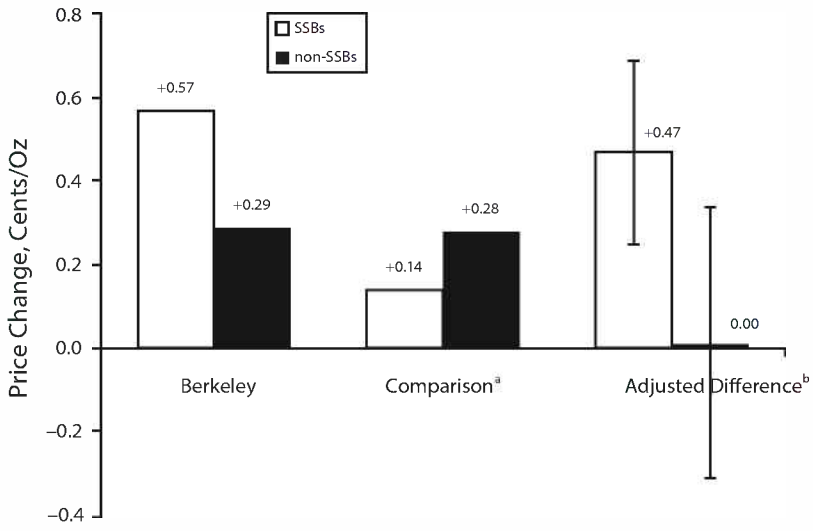
[b]Includes all regular soda, sweetened teas, fruit-flavored beverages, Gatorade, Vitamin Water, Starbucks Frappucino, and Red Bull.

[c]Includes all diet sodas, diet teas, bottled waters, reduced fat milk, 100% orange juice, Vitamin Water Zero, and Red Bull Sugarfree.

*$P < .05$; **$P < .01$; ***$P < .001$.

beverages, including diet soda, water, milk, orange juice, and non-SSBs overall, differences in price changes between Berkeley and the comparison cities were not significant (range: −0.16 to 0.22 cents/oz; $P > .05$). Figure 1 shows price changes for SSBs and non-SSBs overall and differences in these changes between Berkeley and comparison cities. In sensitivity analyses, pass-through rates were similar when including promotional prices for soda, fruit-flavored beverages, and SSBs overall (results not shown).

Table 3 shows results for price increases of SSBs relative to non-SSBs. The price of regular soda increased relative to the price of diet soda by 0.56 cents per ounce (95% CI = 0.24, 0.88) more in Berkeley than in the comparison cities. The price of SSBs overall increased relative to the price of non-SSBs by 0.46 cents per ounce (95% CI = 0.13, 0.79) more in Berkeley than in comparison cities.



Note. SSB = sugar-sweetened beverage. We estimated price change differences using linear regression models and adjusting for retailer type. Error bars show 95% confidence intervals. We collected posttax prices from late May through June 2015, and we collected most pretax prices in fall 2014. We collected fruit-flavored beverage prices from November 2014 through January 2015. Our analyses included sizes typically consumed in a single sitting (e.g., 20-oz soda).

[a]Absolute price increases in Oakland and San Francisco.

[b]Difference in price change between Berkeley and comparison cities.

FIGURE 1—Price changes of SSBs and non-SSBs overall and differences in changes between Berkeley and comparison cities: Berkeley, Oakland, and San Francisco, CA; 2014 and 2015.

Among brands (Table 3), Coke (Coca-Cola Company) had the highest pass-through (0.83 cents/oz), followed by Sprite (Coca-Cola Company; 0.73 cents/oz), Mountain Dew (PepsiCo; 0.68 cents/oz), Dr Pepper (Dr Pepper Snapple Group; 0.56 cents/oz), and Pepsi (PepsiCo; 0.55 cents/oz; $P<.05$). The price of Diet Coke also increased significantly in Berkeley relative to comparison cities (0.32 cents/oz; 95% CI=0.02, 0.61). Relative price changes for other diet sodas (range=–0.50 to 0.17 cents/oz), Gatorade (0.19 cents/oz), Red Bull (–0.27 cents/oz), and Vitamin Water (0.42 cents/oz) were not significant ($P>.05$).

In exploratory analyses examining pass-through by retailer type (Table 4), drugstores generally had the lowest pass-through rates, with similar, nonsignificant price changes for regular (0.18 cents/oz) and diet (0.21 cents/oz) soda, and virtually no price changes for SSBs and non-SSBs overall in Berkeley relative to comparison cities ($P>.05$). For other retailers, pass-through for soda ranged from 0.59 cents per ounce (95% CI=0.05, 1.01) for small grocery stores to 1.35 cents per ounce (95% CI=–0.40, 3.10) for liquor stores. Pass-through for SSBs overall ranged from 0.42 cents per ounce (95% CI=0.00, 0.85) in small grocery stores to 0.97 cents per ounce (95% CI=0.43, 1.51) in liquor stores.

Also in exploratory analyses, price increases for 2-liter bottles and multipacks of regular soda in Berkeley were 0.46 (95% CI=0.03, 0.89) and 0.49 (95% CI=0.21, 0.77) cents per ounce higher, respectively, than were those in comparison cities. Pass-through estimates for these beverages, which we assessed only in supermarkets and drugstores, were similar to the pass-through for 20-ounce bottles sold in supermarkets and drugstores (0.37 cents/oz; 95% CI=0.13, 0.60). However, when considering promotional prices, the pass-through for 2-liter bottles dropped to 0.24 cents per ounce (95% CI=–0.46, 0.94), whereas pass-through for multipacks became 0.56 cents per ounce (95% CI=–0.21, 1.34).

DISCUSSION

Approximately 3 months after implementation of the Berkeley SSB excise tax, we found early evidence that the tax was passed-through to higher SSB retail prices, a meaningful step toward reducing SSB consumption. Pass-through rates in Berkeley were significant for soda (69%), fruit-flavored beverages (47%), and SSBs overall (47%). For soda, this means that a 20-ounce soda costing $1.75 would cost an average of $1.89 after the tax (a 14-cent increase). Pass-through was highest for soda, particularly for Coke (83%). However, the price of Diet Coke also increased more in Berkeley than in comparison cities, though by only 39% of the relative price increase of Coke. Broader categories of untaxed beverages (diet soda, water, milk, orange juice, and non-SSBs) did not significantly increase in price in Berkeley relative to comparison cities.

At this early stage of implementation, we found signs of varying pass-through by retailer type; however, sample size was limited within retail categories. Drugstores exhibited the lowest pass-through rates, suggesting that drugstores may have used regional (rather than store-specific) pricing, distributed tax-related costs across multiple products, or absorbed costs. By contrast, Dollar Tree, a national chain selling products for $1, reacted to the tax by discontinuing SSB sales at its 2 Berkeley locations in January 2015.[48]

For larger soda sizes (assessed only in supermarkets and drugstores), pass-through rates were lower than for 20-ounce sodas on average but were similar to the pass-through rate of 20-ounce sodas from supermarkets and drugstores. However, when considering promotional prices, pass-through for 2-liter bottles was markedly lower. Retailers may have used temporary promotional pricing to maintain SSB demand in the face of SSB taxes.

Because we collected posttax data only 3 months after implementation, we expect to see further price changes in response to the tax. When we spoke with managers of nonchain stores to collect prices, some indicated they planned to change prices whereas others were still uncertain about which beverages were affected and which distributors had raised prices. One manager noted, "It takes a lot to add [the cost of a] new tax for every item. We're still going through the process, and it's June. I think that it would take at least 6 months." As retailers become more aware of the tax and added costs charged by

TABLE 4—Difference in Pre- vs Posttax Beverage Price Changes (Cents/Oz) by Retailer Type: Berkeley, Oakland, and San Francisco, CA; 2014 and 2015

	Supermarket		Small Grocery		Drugstore		Convenience		Liquor	
Beverage	No.	b (95% CI)[a]	No.	b (95% CI)	No.	b (95% CI)	No.	b (95% CI)	No.	b (95% CI)
Soda	11	0.66** (0.21, 1.11)	20	0.59* (0.11, 1.08)	14	0.18 (−0.05, 0.40)	14	0.86* (0.05, 1.67)	12	1.35 (−0.40, 3.10)
Diet soda	11	0.17 (−0.31, 0.65)	16	−0.05 (−0.82, 0.72)	14	0.21 (−0.06, 0.48)	14	0.55 (−0.19, 1.29)	10	−0.19 (−2.17, 1.79)
Difference in regular and diet soda	11	0.50 (−0.06, 1.05)	16	0.74 (−0.01, 1.50)	14	−0.04 (−0.25, 0.18)	14	0.31 (−0.05, 0.67)	10	1.51 (−0.15, 3.17)
Fruit-flavored drinks	6	0.71 (−1.33, 2.75)	17	−0.07 (−1.07, 0.93)	12	0.13 (−0.29, 0.56)	14	1.04 (−0.02, 2.10)	12	0.83* (0.24, 1.42)
Overall SSBs[b]	11	0.58 (−0.32, 1.48)	20	0.42 (0.00, 0.85)	14	0.01 (−0.35, 0.37)	14	0.53 (−0.02, 1.08)	12	0.97** (0.43, 1.52)
Overall non-SSB[c]	11	0.31 (−0.15, 0.76)	18	−0.25 (−0.69, 0.18)	14	−0.08 (−0.59, 0.43)	14	0.49 (−0.18, 1.15)	12	−0.32 (−1.98, 1.33)
Difference in SSB and non-SSB	11	0.27 (−0.61, 1.15)	18	0.65** (0.21, 1.09)	14	0.09 (−0.28, 0.47)	14	0.04 (−0.40, 0.49)	12	1.30 (−0.36, 2.96)

Note. CI = confidence interval; SSBs = sugar-sweetened beverages.

[a]Difference in price changes between Berkeley and comparison cities. From linear regression models in which the dependent variable was price change (posttax price minus pretax price) and the independent variable was a binomial indicator for tax. We collected posttax prices from late May through June 2015, and we collected most pretax prices in fall 2014 (we collected fruit-flavored beverage prices from November 2014 through January 2015). Analyses included sizes typically consumed in a single sitting (e.g., 20-oz soda).

[b]Includes all regular soda, sweetened teas, fruit-flavored beverages, Gatorade, Vitamin Water, Starbucks Frappucino, and Red Bull.

[c]Includes all diet sodas, diet teas, bottled waters, reduced fat milk, 100% orange juice, Vitamin Water Zero, and Red Bull Sugarfree.

*$P < .05$; **$P < .01$; ***$P < .001$.

distributors, we anticipate pass-through rates will increase, especially among small grocery and liquor stores.

Although excise taxes on SSBs have not been implemented elsewhere in the United States for public health purposes, other countries have adopted similar taxes. Effective January 2014, Mexico's peso per liter excise tax on SSBs resulted in a 12% increase in retail prices of soda[35] and a 12% reduction in purchases of taxed SSBs 1 year later.[49] In January 2012, France implemented an 11-euro-cent-per-1.5-liter SSB excise tax that was fully shifted for sodas but undershifted for fruit drinks and flavored waters 6 months later, with pass-through rates varying across retailers.[33] We observed similar patterns of higher pass-through for soda and variability in price changes across retailers. In Denmark, where excise taxes on soft drinks increased in 1998 and 2001, researchers also detected heterogeneity in price changes by retailer as well as overshifting.[34]

These previous empirical studies of SSB tax pass-through have not included concurrent control communities because taxes were implemented in an entire country at the same time.[33–35] We compared price changes in Berkeley to those in nearby cities, allowing us to account for other factors potentially affecting beverage prices at the time of implementation. Another strength of this study is that we collected most pretax prices before the November 2014 elections, reducing the likelihood that baseline data were contaminated by businesses increasing prices in anticipation of the tax.

Limitations

This study has several limitations. We assessed beverage prices at only 2 time points and were unable to assess all beverage types and sizes or nonbeverage items (e.g., food) to which retailers could shift costs. Other data, such as proprietary scanner data, would be necessary to feasibly analyze a broader set of products and sizes; however, such data do not exist for many nonchain stores. Data on changes in the price that distributors charge retailers will be necessary to fully understand pass-through of the tax, because without distributor price increases, retail price increases are unlikely.

At least some large distributors, including a Coke bottler,[50] have increased prices, and our future work will examine variability in distributor response. Although we examined pass-through by retailer type, our sample size limited our ability to test for statistically significant differences in pass-through by retailer type. Additionally, in several stores without price tags, store clerks recalled prices from memory, which may have introduced random error into price data. Lastly, our evaluation did not include all neighborhoods in each city; thus it is possible our sample does not represent pass-through in all geographies. However, all eligible Berkeley supermarket and drugstore chains and 4 national convenience store chains were represented. Thus, our sample contains a mix of centrally located chains and stores in lower-income, minority neighborhoods.

Conclusions

Our finding that Berkeley's SSB excise tax has already resulted in higher retail prices is of major public health importance. This first empirical evidence of early pass-through at the city level foretells pass-through of SSB excise taxes in other cities. As the pass-through in Berkeley evolves and other locations implement SSB taxes, it will be important to continually monitor retail prices because higher prices mediate the effect of excise taxes on consumption. A recent study estimated that a 50% to 150% pass-through rate of a 1-cent-per-ounce excise tax would result in a 10%–30% reduction in consumption.[51] However, it will be crucial to empirically study changes in beverage consumption following such taxes, because this has not yet been done in the United States or at a city level. Additionally, future research can explore whether patterns observed for excise taxes on tobacco, such as lower pass-through rates in areas near

jurisdictions with lower tax rates, occur for SSB excise taxes.[25,29]

Of further importance is the health impact of revenues generated from excise taxes, which hold great promise as a means to sustainably fund public health programs. Lastly, understanding how and why distributors and retailers react to the tax can inform how other jurisdictions develop and implement SSB excise tax legislation. Already results suggest that more information to retailers before implementation might lead to quicker and more complete pass-through. Our ongoing work focuses on measuring changes in SSB consumption between pre- and posttax periods and gathers qualitative information about tax implementation.

Approximately 3 months after implementation of the Berkeley excise tax on SSBs, we found early evidence that SSB retail prices had increased more in Berkeley than in nearby cities, with soda exhibiting the largest price increase. Higher SSB retail prices mark the first step in the causal pathway toward reduced SSB consumption, which could considerably reduce the burden of chronic disease attributed to obesity and other SSB-related health conditions. ■

About the Authors

Jennifer Falbe, Nadia Rojas, and Kristine A. Madsen are with the School of Public Health, University of California, Berkeley. Anna H. Grummon is with the Gillings School of Global Public Health, University of North Carolina, Chapel Hill.

Correspondence should be sent to Jennifer Falbe, ScD, MPH, UC Berkeley School of Public Health, 50 University Hall, Berkeley, CA 94720 (e-mail: jfalbe@berkeley.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

This article was accepted August 20, 2015.

Contributors

J. Falbe and K. A. Madsen designed and conceptualized the study and interpreted the data. J. Falbe, A. H. Grummon, and K. A. Madsen conducted the analysis and drafted the article. N. Rojas contributed to analysis and to article revision.

Acknowledgments

This research was supported by Johns Hopkins University, Global Obesity Prevention Center, the Eunice Kennedy Shriver National Institute of Child Health and Human Development, the National Institutes of Health (NIH), Office of the Director (award U54HD070725), and a University of California Office of the President Multi-Campus Research Initiative grant (PI, Elissa Epel). J. Falbe's work was additionally supported by a postdoctoral fellowship from the American Heart Association (grant 14POST20140055).

Note. The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. The funders had no role in the design, conduct, collection, analysis, or interpretation of data or in the preparation, review, or approval of the article.

Human Participant Protection

No protocol approval was necessary because this research was an analysis of price data and therefore no human participants were involved.

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.

2. Malik VS, Schulze MB, Hu FB. Intake of sugar-sweetened beverages and weight gain: a systematic review. *Am J Clin Nutr.* 2006;84(2):274–288.

3. 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.

4. Hu FB. Resolved: there is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. *Obes Rev.* 2013;14(8):606–619.

5. Singh GM, Micha R, Khatibzadeh S, et al. Estimated global, regional, and national disease burdens related to sugar-sweetened beverage consumption in 2010. *Circulation.* 2015;132(8):639–666.

6. Block G. Foods contributing to energy intake in the US: data from NHANES III and NHANES 1999–2000. *J Food Compos Anal.* 2004;14(3–4):439–447.

7. Reedy J, Krebs-Smith SM. Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. *J Am Diet Assoc.* 2010;110(10):1477–1484.

8. Centers for Disease Control and Prevention. The CDC guide to strategies for reducing the consumption of sugar-sweetened beverages. 2010. Available at: http://www.cdph.ca.gov/SiteCollectionDocuments/StratstoReduce_Sugar_Sweetened_Bevs.pdf. Accessed March 15, 2011.

9. US Department of Agriculture, US Department of Health and Human Services. *Dietary Guidelines for Americans, 2010.* Washington, DC: US Government Printing House; 2010.

10. Centers for Disease Control and Preventin. Recommended community strategies and measurements to prevent obesity in the United States. *MMWR Recomm Rep.* 2009;58(RR-7):1–26.

11. Jha P, Chaloupka FJ, Moore J, et al. Tobacco addiction. In: Jamison DT, Breman JG, Measham AR, et al., eds. *Disease Control Priorities in Developing Countries.* Washington, DC: World Bank; 2006: 869–885.

12. Brownell KD, Frieden TR. Ounces of prevention—the public policy case for taxes on sugared beverages. *N Engl J Med.* 2009;360(18):1805–1808.

13. Brownell KD, Farley T, Willett WC, et al. The public health and economic benefits of taxing sugar-sweetened beverages. *N Engl J Med.* 2009;361(16):1599–1605. [Erratum in *N Engl J Med.* 2010;362(13):1250]

14. Institute of Medicine. *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation.* Washington, DC: National Academies Press; 2012.

15. Institute of Medicine. *Local Government Actions to Prevent Childhood Obesity.* Washington, DC: National Academy of Science; 2009.

16. Rudd Center for Food Policy and Obesity. Legislation database. 2015. Available at: http://www.uconnruddcenter.org/legislation-database. Accessed June 13, 2015.

17. Government of Alameda County. November 4, 2014—general election results. 2015. Available at: http://www.acgov.org/rov/elections/20141104. Accessed July 1, 2015.

18. Chriqui JF, Chaloupka FJ, Powell LM, Eidson SS. A typology of beverage taxation: multiple approaches for obesity prevention and obesity prevention-related revenue generation. *J Public Health Policy.* 2013;34(3):403–423.

19. Finkelstein EA, Zhen C, Bilger M, Nonnemaker J, Farooqui AM, Todd JE. Implications of a sugar-sweetened beverage (SSB) tax when substitutions to non-beverage items are considered. *J Health Econ.* 2013;32(1):219–239.

20. Fullerton D, Metcalf GE. Tax incidence. In: Alan JA, Martin F, eds. *Handbook of Public Economics.* Vol 4. Amsterdam, The Netherlands: Elsevier; 2002:1787–1872.

21. Powell LM, Chriqui JF, Khan T, Wada R, Chaloupka FJ. Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand and body weight outcomes. *Obes Rev.* 2013;14(2):110–128.

22. Cornelsen L, Green R, Dangour A, Smith R. Why fat taxes won't make us thin. *J Public Health (Oxf).* 2015;37(1):18–23.

23. Pomeranz JL. Sugary beverage tax policy: lessons learned from tobacco. *Am J Public Health.* 2014;104(3):e13–e15.

24. DeCicca P, Kenkel D, Liu F. Who pays cigarette taxes? The impact of consumer price search. *Rev Econ Statistics.* 2012;95(2):516–529.

25. Harding M, Leibtag E, Lovenheim MF. The heterogeneous geographic and socioeconomic incidence of cigarette taxes: evidence from Nielsen Homescan Data. *Am Econ J Econ Policy.* 2012;4(4):169–198.

26. Hanson A, Sullivan R. The incidence of tobacco taxation: evidence from geographic micro-level data. *Natl Tax J.* 2009;62(4):677–698.

27. Brock B, Choi K, Boyle RG, Moilanen M, Schillo BA. Tobacco product prices before and after a statewide tobacco tax increase. *Tob Control.* 2015;Epub ahead of print.

28. Chiou L, Muehlegger E. Consumer response to cigarette excise tax changes. *Natl Tax J.* 2014;67(3):621–650.

29. Sullivan RS, Dutkowsky DH. The effect of cigarette taxation on prices: an empirical analysis using local-level data. *Public Finance Rev.* 2012;40(6):687–711.

30. Kenkel DS. Are alcohol tax hikes fully passed through to prices? Evidence from Alaska. *Amer Econ Rev.* 2005;95(2):273–277.

31. Young DJ, Bielinska-Kwapisz A. Alcohol taxes and beverage prices. *Natl Tax J.* 2002;55(1):57–73.

32. Jensen JD, Smed S. The Danish tax on saturated fat—short run effects on consumption, substitution patterns and consumer prices of fats. *Food Policy.* 2013;42:18–31.

33. Berardi N, Sevestre P, Tepaut M, Vigneron A. *The Impact of a 'Soda Tax' on Prices: Evidence From French Micro Data*. Paris, France: Banque de France; 2012. Working Paper No. 415.

34. Bergman UM, Hanson LH. Are excise taxes on beverages fully passed through to prices? The Danish evidence. 2013. Available at: http://www.econ.ku.dk/okombe/MBNLH.pdf. Accessed June 1, 2015.

35. Grogger J. Soda taxes and the prices of sodas and other drinks: evidence from Mexico. 2015. Available at: http://www.nber.org/papers/w21197. Accessed June 15, 2015.

36. The City of Berkeley. Election information: 2014 ballot measures. 2014. Available at: https://www.cityofberkeley.info/Clerk/Elections/Election__2014_Ballot_Measure_Page.aspx. Accessed October 20, 2014.

37. Stelzer A. Berkeley soda tax brings in $116,000 in first month. *KQED News*. May 19, 2015.

38. Beverage Digest. US beverage results for 2013. 2014. Available at: http://www.beverage-digest.com/pdf/top-10_2014.pdf. Accessed May 15, 2014.

39. Beverage Industry. 2012 state of the industry: tea and ready-to-drink tea. 2012. Available at: http://www.bevindustry.com/articles/85658-2012-state-of-the-industry-tea-and-ready-to-drink-tea. Accessed March 15, 2014.

40. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA*. 2014;311(8):806–814.

41. Ogden CL, Kit BK, Carroll MD, Park S. Consumption of sugar drinks in the United States, 2005–2008. *NCHS Data Brief*. 2011;(71):1–8.

42. US Census Buereau. 2006–2010 5-year American Community Survey (ACS): 5-year estimates. 2010. Available at: http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_13_5YR_S1701&prodType=table. Accessed February 8, 2014.

43. Reitzel LR, Regan SD, Nguyen N, et al. Density and proximity of fast food restaurants and body mass index among African Americans. *Am J Public Health*. 2014;104(1):110–116.

44. Langellier BA. The food environment and student weight status, Los Angeles County, 2008–2009. *Prev Chronic Dis*. 2012;9:E61.

45. Morland K, Wing S, Diez Roux A, Poole C. Neighborhood characteristics associated with the location of food stores and food service places. *Am J Prev Med*. 2002;22(1):23–29.

46. US Census Bureau. North American industry classification system. 2014. Available at: http://www.census.gov/eos/www/naics. Accessed August 8, 2014.

47. Infogroup. ReferenceUSA. 2014. Available at: http://www.referenceusa.com/Static/AboutUs. Accessed July 1, 2014.

48. Yee SY. Berkeley Dollar Tree pulls soda off shelves due to sugary drink tax. *KQED News*. June 23, 2015.

49. University of North Carolina at Chapel Hill Food Research Program. Purchases of taxed beverages decline in Mexico after excise tax takes effect. 2015. Available at: http://uncfoodresearchprogram.web.unc.edu/822. Accessed June 17, 2015.

50. Reich R, Capitelli L, Alexander V. Op-ed: the Berkeley tax may have passed, but the campaign has not ended for big soda. *Berkeleyside*. March 19, 2015.

51. Long MW, Gortmaker SL, Ward ZJ, et al. Cost effectiveness of a sugar-sweetened beverage excise tax in the US. *Am J Prev Med*. 2015;49(1):112–123.

EXHIBIT I

Impact of the Berkeley Excise Tax on Sugar-Sweetened Beverage Consumption

Jennifer Falbe, ScD, MPH, Hannah R. Thompson, PhD, MPH, Christina M. Becker, BA, Nadia Rojas, MPH, Charles E. McCulloch, PhD, and Kristine A. Madsen, MD, MPH

Objectives. To evaluate the impact of the excise tax on sugar-sweetened beverage (SSB) consumption in Berkeley, California, which became the first US jurisdiction to implement such a tax ($0.01/oz) in March 2015.

Methods. We used a repeated cross-sectional design to examine changes in pre- to posttax beverage consumption in low-income neighborhoods in Berkeley versus in the comparison cities of Oakland and San Francisco, California. A beverage frequency questionnaire was interviewer administered to 990 participants before the tax and 1689 after the tax (approximately 8 months after the vote and 4 months after implementation) to examine relative changes in consumption.

Results. Consumption of SSBs decreased 21% in Berkeley and increased 4% in comparison cities ($P = .046$). Water consumption increased more in Berkeley (+63%) than in comparison cities (+19%; $P < .01$).

Conclusions. Berkeley's excise tax reduced SSB consumption in low-income neighborhoods. Evaluating SSB taxes in other cities will improve understanding of their public health benefit and their generalizability. (*Am J Public Health.* 2016;106:1865–1871. doi: 10.2105/AJPH.2016.303362)

See also Galea and Vaughan, p. 1730.

Reducing sugar-sweetened beverage (SSB) consumption has become a public health priority because of strong evidence that SSBs increase risk of obesity, diabetes, heart disease, and dental caries.[1,2] Because of the success of tobacco taxation[3] and evidence from economic research,[4,5] public health experts have called for excise taxes on SSBs to reduce consumption.[6,7] Most US states have sales taxes on SSBs; however, they are typically too low to have a meaningful impact on consumption, are applicable to both SSBs and non-SSBs, and are added at the register—after a consumer has decided to purchase an SSB.[8] Excise taxes, however, are expected to have greater saliency for consumers because they translate into higher shelf prices,[9,10] which consumers see before deciding what to purchase.

From 2013 to 2014, more than a dozen states and several cities proposed SSB tax legislation.[11] However, in November of 2014, Berkeley, California, became the first and only US jurisdiction to pass an SSB excise tax for public health purposes.[12] Berkeley levied the $0.01-per-ounce tax on distribution of SSBs, including soda; energy, sports, and fruit-flavored drinks; sweetened water, coffee, and tea; and syrups used to make SSBs (non-SSBs such as diet soda are not taxed).[13] We had previously found that, on average, 69% of the tax was passed through to higher retail prices of soda, and 47% was passed through to higher retail prices of SSBs overall.[10] To date, the only other evidence on SSB excise taxes comes from outside the United States, in countrywide interventions without control groups.[14,15]

We sought to provide the first evaluation of an SSB excise tax in the United States by estimating the impacts of Berkeley's SSB excise tax on SSB consumption, and used neighboring San Francisco and Oakland, California, as comparison cities to account for secular trends locally. In addition, we examined other perceived behavioral changes resulting from the tax, such as shifts in portion size and cross-border purchasing.

METHODS

We used a repeated cross-sectional design to examine pre- to posttax beverage consumption in Berkeley versus in Oakland and San Francisco, selected as comparison cities because of their proximity and mix of commercial and residential environments. San Francisco also considered an SSB tax in 2014 but failed to garner the 67% of votes required to pass.[16]

On November 4, 2014, the Berkeley SSB tax was voted into law. Implementation of tax collection from distributors began March 1, 2015. We collected pretax data in April through July 2014, before the elections and before major news coverage of the campaigns.[17] We collected posttax data in April through August 2015.

Our sampling focused on low-income and minority populations, who are more likely to consume SSBs and suffer related health consequences.[18,19] Thus, within Berkeley and San Francisco, we selected 2 large, low-income neighborhoods that yielded the highest combined proportion of African American and Hispanic residents according to 2010 census tract data.[20] Using census tract

ABOUT THE AUTHORS

Jennifer Falbe, Hannah R. Thompson, Christina M. Becker, Nadia Rojas, and Kristine A. Madsen are with the School of Public Health, University of California, Berkeley. Charles E. McCulloch is with the Department of Epidemiology and Biostatistics, University of California, San Francisco.

Correspondence should be sent to Kristine Madsen, MD, MPH, UC Berkeley School of Public Health, 219 University Hall, #7360, Berkeley, CA 94720-7360 (e-mail: madsenk@berkeley.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

This article was accepted June 24, 2016.

doi: 10.2105/AJPH.2016.303362

characteristics in Berkeley and San Francisco, we then selected census tracts in Oakland that would provide the most similar percentages of Hispanic and African American residents. Within each neighborhood, we administered intercept surveys near the highest foot-traffic intersection. According to 2014 census estimates, average proportions of African American and Latino residents within the intersections' census tracts were 25% and 28%, respectively, in Berkeley; 26% and 37% in Oakland; and 25% and 45% in San Francisco, compared with citywide percentages of 9% and 11% (Berkeley), 26% and 26% (Oakland), and 6% and 15% (San Francisco).[21] Average household median incomes for these tracts versus the entire city were $59 000 versus $65 000 in Berkeley, $46 000 versus $53 000 in Oakland, and $52 000 versus $78 000 in San Francisco.[21]

Measures

We assessed beverage consumption via interviewer-administered intercept surveys with a beverage frequency questionnaire modified from the Behavioral Risk Factor Surveillance System 2011 SSB module.[22] Participants were asked, "How often do you drink . . .?" for each beverage: "regular soda (not diet), like Coke or Sprite"; "energy drinks like Red Bull"; "sports drinks like Gatorade"; "fruit drinks like lemonade or fruit punch, not 100% juice"; "sweetened coffee or tea like Arizona iced tea or bottled Frappuccino"; as well as for "unsweetened water, bottled or tap." Participants reported frequency as times per day, week, or month. We converted weekly and monthly intakes to daily intake by dividing by 7 and 30, respectively. To calculate total SSB frequency, we summed frequencies for soda, energy drinks, sports drinks, fruit drinks, and sweetened coffee or tea.

Surveys also assessed age, race/ethnicity, gender, and educational attainment. Posttax surveys assessed awareness of the tax: "Thinking back to the election in November, from what you remember, did [city name] have a soda tax on the ballot?" Berkeley posttax surveys assessed cross-border purchasing—purchasing SSBs outside Berkeley to avoid tax-related costs—asking where residents primarily bought SSBs in 2014 and in the past month, and, if they switched cities, why. To understand if people perceived having made behavioral changes in response to any aspect of the tax, we asked, "As a result of the soda tax or its campaigns, did you make any changes to what you drink?" If they responded "yes," we asked about changes in frequency (less often vs no change or more often) and size of consumed beverages (smaller vs no change or larger).

Surveys were approximately 3 to 10 minutes long and administered in English or Spanish on weekdays from 10:30 AM to 5:30 PM. A small incentive (a water bottle or reusable bag worth < $1.00) was provided.

Eligible participants had to live in the city where the survey was conducted, be aged 18 years or older, and speak English or Spanish. Trained interviewers invited every passerby to participate. Figure 1 shows participant flow. Among those invited before the tax, 1239 (17%) individuals stopped to speak to an interviewer and were screened, of which 1048 (85%) were eligible. Among those invited after the tax, 2502 (20%) were interested and screened, of which 1941 (78%) were eligible. The proportion declining to participate was similar before and after the tax, but a smaller proportion of passersby were eligible after the tax. At both times, fewer residents were eligible in Berkeley than in comparison cities (Figure 1).

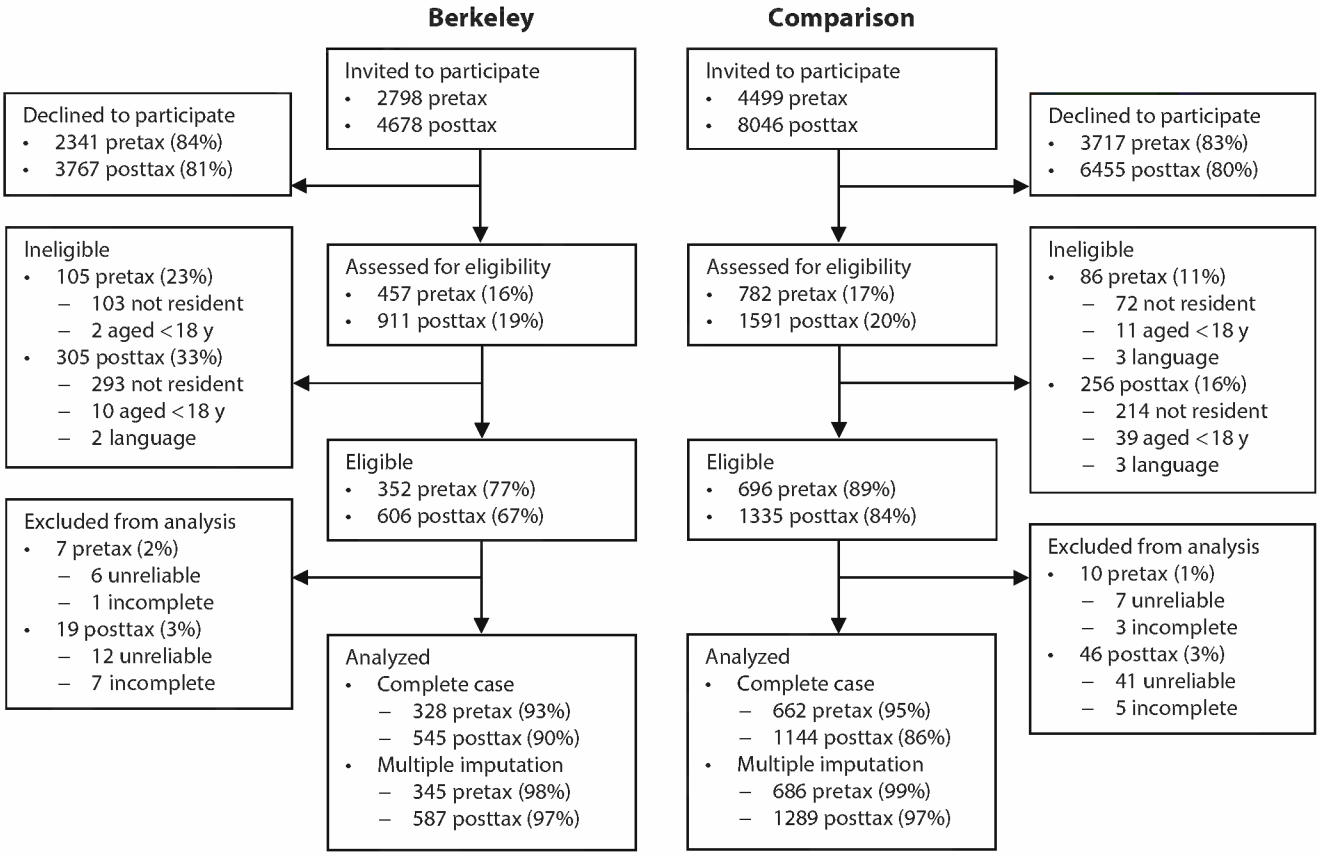
After we excluded 66 participants who appeared to provide unreliable responses (e.g., because of difficulty hearing), 16 who left before completing beverage questions, 27 who were missing SSB consumption, and 201 who were additionally missing covariate data, the primary analytic sample for examining SSB consumption comprised 2679 (90% of those eligible): 328 in Berkeley and 662 in comparison cities before the tax, and 545 in Berkeley and 1144 in the comparison cities after the tax. Because 242 were also missing water consumption data, the analytic sample for examining water consumption included 2437 (82% of those eligible). In sensitivity analyses that used multiple imputation, the analytic sample included 2907 observations (97% of those eligible).

Statistical Analysis

Using a difference-in-differences approach, we estimated pre- to posttax changes in beverage consumption in Berkeley relative to that in comparison cities. For each beverage, we modeled frequency of beverage consumption by using separate generalized linear regression models with a γ distribution and a log link.[23] The γ distribution accounted for the fact that beverage consumption cannot be negative and has a right-skewed distribution. The log link allowed us to directly model mean beverage consumption and obtain results that can be interpreted in terms of percent change in consumption. These models included an indicator for Berkeley, an indicator for posttax time period, and an interaction term for Berkeley and posttax time period. The indicator for Berkeley adjusted for pretax differences between Berkeley and the comparison cities. Because we used a log–link, the exponentiated coefficient for posttax period indicated the percent change in beverage consumption in the comparison cities (i.e., the ratio of post- to pretax consumption). The exponentiated interaction term for Berkeley and posttax period indicated how much more beverage consumption changed in Berkeley than in comparison cities (i.e., the ratio of post- to pretax consumption in Berkeley relative to that in comparison cities).

We adjusted all models for gender, race/ethnicity (African American, Hispanic, White, and other), age category (< 30, 30–39, 40–49, 50–59, ≥ 60 years), education (< high school, high school or GED, some college, college degree, graduate school), language, and neighborhood. Because of sizeable percentages of zero values for beverage consumption, we used robust standard errors to ensure valid inferences.

In our primary analysis, we conducted a complete case analysis, excluding observations with missing outcome or covariate data. In sensitivity analyses, we used multiple imputation by chained equations to impute missing SSB consumption (n = 27 [1%]), water consumption (n = 267 [9%]), and covariates (n = 203 [7%]), generating 20 data sets and a sample size of 2907. The imputation model included gender, race/ethnicity, age, education, neighborhood, time, interviewer, and SSB and water consumption.



Note. Complete-case analysis of water consumption excluded those additionally missing data on water consumption and included 285 before the tax and 501 after the tax in Berkeley and 606 before the tax and 1045 after the tax in comparison cities.

FIGURE 1—Participant Flow During Pre- (2014) and Posttax (2015) Periods in Berkeley, CA, and Comparison Cities (Oakland and San Francisco, CA)

Numbers and percentages are presented for awareness of the tax and perceived behavioral changes among those who responded to these questions. We used logistic regression models to determine if awareness of SSB taxes differed significantly by city, adjusting for the same covariates used in models of beverage consumption. We conducted analyses in Stata/IC version 13.1 (StataCorp LP, College Station, TX).

RESULTS

Table 1 shows participant characteristics. Relative to comparison cities, Berkeley participants had higher educational attainment and were slightly older, less likely to be female and Hispanic, and more likely to be White. Posttax participants were older than pretax participants. In comparison cities, posttax participants were more likely than pretax participants to be female, to have a lower educational attainment, and to have done the survey in Spanish.

Table 2 compares change in consumption in Berkeley to change in the comparison cities. After passage of Berkeley's SSB tax, adjusted consumption of SSBs decreased in Berkeley (–21%) and increased in the comparison cities (+4%); Figure 2; $P = .046$). Specifically, adjusted consumption of regular soda decreased by 26% in Berkeley and increased by 10% in the comparison cities ($P = .05$), and adjusted consumption of sports drinks decreased by 36% in Berkeley and increased by 21% in the comparison communities ($P = .02$). In addition, as illustrated in Figure 2, water consumption increased more in Berkeley (+63%) than in comparison cities (+19%; $P < .01$). For other specific beverages, differences between Berkeley and comparison cities were not significant.

In a sensitivity analysis, after we imputed covariates and outcomes, coefficients indicating change in consumption in Berkeley relative to in the comparison cities remained the same for SSBs and soda, and the coefficient for soda was significant ($P = .04$). Results for water and sports drinks were similar with imputed data, but the coefficient for sports drinks was not significant ($P = .10$),

When asked if a soda tax had been on their city's ballot, 68% in Berkeley, 56% in San Francisco, and 28% in Oakland replied yes (*P*s for differences < .05).

Table A (available as a supplement to the online version of this article at http://www.ajph.org) presents perceived behavioral changes in Berkeley related to the tax. Only 18 respondents (5% of those who reported buying SSBs in Berkeley before the tax)

TABLE 1—Characteristics of 2679 Participants During Pre- (2014) and Posttax (2015) Periods in Berkeley, CA, and Comparison Cities (Oakland and San Francisco, CA)

Characteristic	Berkeley			Comparison Cities			*P* for Differences[a]	
	Pretax (n = 328), Mean ±SD or %	Posttax (n = 545), Mean ±SD or %	*P*[b]	Pretax (n = 662), Mean ±SD or %	Posttax (n = 1144), Mean ±SD or %	*P*[b]	Pretax	Posttax
Age, y	43 ±16	46 ±17	.01	39 ±15	44 ±16	<.001	<.001	.01
Female	46	53	.10	54	60	<.01	.04	<.01
Race/ethnicity								
African American	33	31	.70	34	33	.71	.77	.59
Hispanic	24	20	.18	36	38	.32	<.001	<.001
White	27	32	.18	18	16	.17	<.01	<.001
Other	16	17	.74	13	14	.56	.28	.03
Survey in Spanish	10	13	.17	17	25	<.01	<.01	<.001
Highest education								
< high school	6	10	.07	12	20	<.001	.01	<.001
High school or GED	22	19	.29	30	24	<.01	<.01	<.01
Some college	30	26	.18	27	30	.28	.29	.18
College graduate	25	27	.39	21	19	.29	.18	<.001
Graduate school	17	18	.68	10	8	.13	<.01	<.001

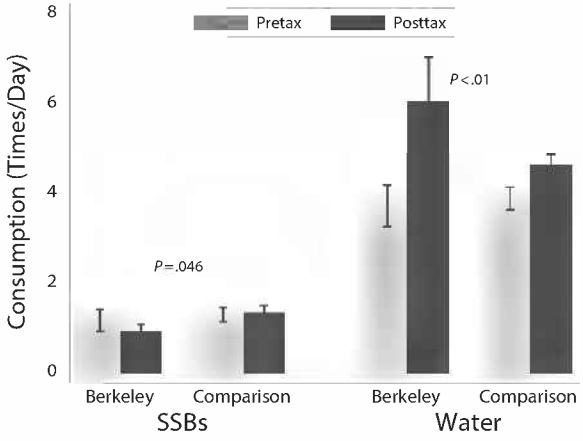
Note. GED = general equivalency diploma. Percentages were calculated by excluding those with missing data from the denominator.
[a]Between Berkeley, California, and comparison cities.
[b]For differences between pre- and posttax periods within cities.

reported switching SSB purchases to another city after the tax. Of these, 6 respondents (2%) reported switching because of the tax or prices. In addition, of the 124 (22%) who reported changing drinking habits because of the tax, 101 (82%) reported drinking SSBs less frequently and 48 (40%) reported drinking smaller sizes because of the tax.

TABLE 2—Beverage Consumption and Pre- to Posttax Change (%) in Consumption in Berkeley, CA, Versus Comparison Cities (Oakland and San Francisco, CA) Among 2679 Participants

Consumption (Times/Day)	Berkeley, CA (n = 873)				Comparison Cities (n = 1806)				Ratio of Post- to Pretax Consumption in Berkeley Relative to Comparison Cities (n = 2679), B[b] (95% CI)
	Unadjusted Pretax, Mean ±SD	Unadjusted Posttax,[a] Mean ±SD	Unadjusted Absolute Difference	Adjusted[b] Percent Change[c]	Unadjusted Pretax, Mean ±SD	Unadjusted Posttax,[a] Mean ±SD	Unadjusted Absolute Difference	Adjusted[b] Percent Change[c]	
SSBs	1.25 ±2.25	0.97 ±1.66	−0.28	−21	1.29 ±1.76	1.26 ±2.09	−0.03	+4	0.76 (0.58, 0.995)
Regular soda	0.47 ±1.40	0.34 ±0.86	−0.13	−26	0.44 ±0.79	0.47 ±1.11	+0.03	+10	0.67 (0.45, 1.00)
Sports drinks	0.18 ±0.49	0.12 ±0.42	−0.06	−36	0.18 ±0.45	0.17 ±0.56	−0.01	+21	0.53 (0.31, 0.91)
Energy drinks	0.09 ±0.51	0.05 ±0.24	−0.04	−29	0.07 ±0.28	0.07 ±0.32	0.00	−14	0.83 (0.38, 1.82)
Fruit drinks	0.28 ±0.57	0.26 ±0.65	−0.03	−13	0.39 ±0.79	0.34 ±0.81	−0.06	−12	0.99 (0.69, 1.44)
Sweetened coffee or tea	0.23 ±0.57	0.21 ±0.61	−0.02	−13	0.21 ±0.56	0.21 ±0.59	0.00	+22	0.71 (0.44, 1.15)
Water[d]	3.50 ±3.24	5.84 ±10.38	+2.33	+63	3.98 ±3.12	4.69 ±3.53	+0.70	+19	1.37 (1.14, 1.64)

Note. CI = confidence interval; SSB = sugar-sweetened beverage.
[a]Posttax data were collected approximately 12 months after pretax data collection, 8 months after elections, and 4 months after implementation of the tax.
[b]Adjusted for gender, age, education, race/ethnicity, language, and neighborhood in which the survey was conducted. Generalized linear models were used with a γ distribution, log link, and robust standard errors.
[c]From adjusted within-city ratio of post- to pretax consumption.
[d]Sample sizes for water included 2437—786 in Berkeley and 1651 in comparison cities.



Note. Adjusted means and 95% confidence intervals were obtained by using the margins command in Stata/IC version 13.1 (StataCorp LP, College Station, TX) after running generalized linear models adjusting for neighborhood, gender, age, education, race/ethnicity, and language. *P* values shown are for the difference between Berkeley and comparison cities in change in consumption and come from the generalized linear models.

FIGURE 2—Adjusted Mean Consumption of Sugar-Sweetened Beverages (SSBs) and Water Before and After the Tax in Berkeley, CA, and Comparison Cities (Oakland and San Francisco, CA)

DISCUSSION

This study provides the first evidence on the impact of an SSB excise tax on beverage consumption in the United States. In low-income neighborhoods in Berkeley, SSB consumption declined by 21% over a 1-year period from before the tax to after the tax, and increased by 4% in the comparison neighborhoods over the same period, a statistically significant difference. Regular soda and sports drink consumption similarly showed greater decreases whereas water consumption demonstrated a greater increase in Berkeley versus comparison cities.

Although Berkeley is the first US jurisdiction to pass an SSB excise tax, other countries have implemented such taxes. Mexico's 1-peso-per-liter SSB excise tax (equivalent to a 10% price increase) resulted in a 12% reduction in purchases of taxed SSBs 1 year later.[14] France saw a 6.7% decline in demand for regular cola in the first 2 years after an 11 euro-cent per 1.5-liter SSB excise tax[15] (corresponding to a 6% price increase[24]). Although the SSB excise taxes in Mexico and France appear to have reduced SSB consumption, because they were implemented nationwide, evaluations did not include concurrent comparison groups to account for secular trends. A major strength of our study is inclusion of comparison cities.

Excise taxes are hypothesized to reduce consumption by raising prices. In a longitudinal study of 71 stores, we examined how retail prices changed in Berkeley versus in the comparison cities before and after the tax (i.e., pass-through).[10] We had found that, on average, 69% of Berkeley's SSB tax was passed through to higher soda prices, and 47% was passed through to prices of SSBs overall.[10] Pass-through varied considerably by retailer type and beverage. These analyses were not weighted by sales, and because soda is the largest contributor of SSB calories in the United States,[19] 47% may be a conservative estimate. However, a 47% pass-through is equivalent to about an 8% price increase.[25] Powell et al. recently reviewed price elasticity of demand estimates for SSBs—the percent change in demand for SSBs resulting from a 1% increase in price.[5] They reported an average price elasticity for SSBs of −1.2 (range = −0.71 to −3.87).

On the basis of these estimates,[5] and the early SSB price increases of 8% in Berkeley,[10] Berkeley's SSB tax would be predicted to reduce consumption by approximately 10% (range = 6% to 31%). The 21% reduction in SSB consumption that we saw in low-income Berkeley neighborhoods represents a price elasticity of −2.6, and the relative reduction we saw of 25% (relative to comparison neighborhoods) would represent a price elasticity of −3.1. In Mexico and France, in which pass-through rates were higher,[24,26] reductions in purchases of SSBs following an SSB tax[14,15] were approximately consistent with the average price elasticity of −1.2.[5] The greater reduction in Berkeley could reflect greater price sensitivity in the San Francisco Bay Area or, specifically, among lower-income populations. In Mexico, households of low-socioeconomic status were most responsive to the tax, reducing purchases by 17% (compared with 12% overall).[14] Few studies have examined differential responsiveness to food taxes by socioeconomic status, and results have been mixed.[27,28]

The magnitude of our results may also reflect an early reaction to the tax that could rebound and settle closer to a 10% reduction in consumption; however, Mexico's reduction in SSB purchases increased over the year following the tax.[14] Alternatively, stronger than expected results in Berkeley could be attributable to greater overall health consciousness. Ongoing evaluation in Berkeley and studies in other cities proposing SSB taxes will be critical to sort out long-term impact.

The greater-than-predicted reduction in consumption in Berkeley could also reflect effects of the campaign surrounding the tax, which may have shifted social norms[29] and thus reduced consumption. Whereas dozens of jurisdictions failed to pass SSB taxes, the Berkeley protax campaign—"Berkeley vs. Big Soda"—achieved success, which has been attributed to early and diverse coalition building, reflected in the campaign having prominently featured community representatives and endorsements from a wide range of supporters.[17] Campaign messages focused not only on health harms of SSBs, but also on inappropriate behavior by the SSB industry.[17] Campaign exposure, knowledge that the tax passed by a high margin (76%) of votes,[13] or awareness of widespread support for the tax may have altered social norms, but we did not assess social norms. Future research on SSB-related policies should study potential mediating effects of perceived norms.

In SSB tax debates, it has been argued that cross-border shopping would undermine the tax's effectiveness.[30] However, we found that very few—only 2%—of Berkeley residents

who reported having bought SSBs primarily in Berkeley before the tax reported that they switched to buying SSBs elsewhere as a result of the tax or prices. Also, a greater proportion of Berkeley residents reported having reduced how frequently they consume SSBs, rather than reducing SSB portion size. Going forward, it will be important to monitor consumers' changes in behavior in response to SSB taxes and the beverage industry's responses to consumer demand (e.g., reformulation, altering can or bottle size, and promotion), to fully understand the potential public health impacts of SSB taxes.

Limitations

Although our results suggest that SSB taxes can significantly reduce SSB consumption, Berkeley is a single city of relatively high socioeconomic status,[21] and results may not generalize to other cities. Although intercept surveys allowed us to focus on low-income neighborhoods, the use of repeated cross-sections reduced power and limited analytic options. Also, it is probable that our samples were not independent, so our analysis likely overestimated standard errors for pre- versus posttax change (and hence understated statistical significance). Although our beverage questions asked about frequency, not size, of SSBs, multiple studies have shown that adding portion-size questions have little impact on nutrient correlations between food frequency questionnaires and gold standards.[31] We did not assess a comprehensive list of non-SSBs, including diet soda, so it was not possible to examine beverage substitution beyond water.

It is possible that factors unrelated to the taxes affected consumption; however, we are unaware of concurrent interventions in Berkeley during this time period, and the increase in SSB consumption in comparison cities suggests that external factors may have encouraged higher consumption in the Bay Area. The region experienced higher-than-average temperatures in the relevant months of 2015 compared with 2014.[32] Although we adjusted for differences in participant characteristics between cities and time points in our models, with any nonrandomized design, there is the possibility of unmeasured and residual confounding.

We did not collect measures of self-reported height, weight, or desire to lose or maintain weight, which may have been associated with magnitude of change in SSB consumption in response to the tax. Also, self-reported behaviors are vulnerable to social desirability bias; this was partially addressed by including comparison cities, but SSB sales data could provide complementary objective evidence. Our posttax sample sizes were larger than pretax sample sizes, but samples were larger by a similar proportion across all cities, minimizing potential for differential impact by city.

Lastly, we collected posttax consumption data less than 6 months after implementation, reflecting short-term impacts of the tax. Because Berkeley's SSB tax ordinance does not specify adjusting the tax to account for inflation, price effects on consumption may decrease somewhat over time. Currently, model SSB tax legislation includes adjustment based on the Consumer Price Index.[33]

Public Health Implications

An SSB excise tax is one of the few public health interventions expected to reduce health disparities, save more money than it costs, and generate substantial revenues for public health programs.[25,34] Already, Berkeley city council has allocated $1.5 million to fund programs to reduce SSB consumption and address obesity for the 2016–2017 fiscal year.[35] In addition, a recent modeling study found that a national SSB tax resulting in a reduction in consumption on par with what we observed would result in lower child and adult body mass index (defined as weight in kilograms divided by the square of height in meters) and avert 101 000 disability-adjusted life-years over a decade.[25] Although the present study provides short-term results, it is the first evaluation of an SSB excise tax implemented in the United States and provides evidence that a $0.01 per ounce city-level SSB tax reduced SSB consumption in vulnerable neighborhoods in Berkeley. If impacts in Berkeley persist, and evidence from other cities passing SSB taxes corroborate our findings, widespread adoption of SSB excise taxes could have considerable fiscal and public health benefits. AJPH

CONTRIBUTORS

J. Falbe co-conceptualized and oversaw all aspects of study implementation, analyzed study data, and drafted the article. H. R. Thompson assisted with study design and data collection. C. M. Becker and N. Rojas assisted with data collection and data entry. C. E. McCulloch led data analyses. K. A. Madsen co-conceptualized the study and co-wrote the article.

ACKNOWLEDGMENTS

This research was supported by The Global Obesity Prevention Center, Johns Hopkins University; the Eunice Kennedy Shriver National Institute of Child Health and Human Development and the Office of the Director (award U54HD070725), National Institutes of Health; Community Health Equity and Promotion Branch, San Francisco Department of Public Health; and a University of California Office of the President Multi-Campus Research Initiative grant (PI, Elissa Epel). J. Falbe's work was additionally supported by a postdoctoral fellowship from the American Heart Association (grant 14POST20140055).

HUMAN PARTICIPANT PROTECTION

This study was deemed exempt by UC Berkeley's institutional review board because it involved only anonymous survey data; thus, review was not needed.

REFERENCES

1. Malik VS, Popkin BM, Bray GA, Despres JP, Hu FB. Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. *Circulation*. 2010; 121(11):1356–1364.

2. Hu FB. Resolved: there is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. *Obes Rev*. 2013;14(8):606–619.

3. Jha P, Chaloupka FJ, Moore J, et al. Tobacco addiction. In: Jamison DT, Breman JG, Measham AR, et al., eds. *Disease Control Priorities in Developing Countries*. Washington, DC: World Bank; 2006.

4. Andreyeva T, Long MW, Brownell KD. The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. *Am J Public Health*. 2010;100(2):216–222.

5. Powell LM, Chriqui JF, Khan T, Wada R, Chaloupka FJ. Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand and body weight outcomes. *Obes Rev*. 2013;14(2):110–128.

6. Brownell KD, Farley T, Willett WC, et al. The public health and economic benefits of taxing sugar-sweetened beverages. *N Engl J Med*. 2009;361(16):1599–1605.

7. Institute of Medicine. *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation*. Washington, DC: The National Academies Press; 2012.

8. Chriqui JF, Chaloupka FJ, Powell LM, Eidson SS. A typology of beverage taxation: multiple approaches for obesity prevention and obesity prevention-related revenue generation. *J Public Health Policy*. 2013;34(3):403–423.

9. Brownell KD, Frieden TR. Ounces of prevention—the public policy case for taxes on sugared beverages. *N Engl J Med*. 2009;360(18):1805–1808.

10. Falbe J, Rojas N, Grummon AH, Madsen KA. Higher retail prices of sugar-sweetened beverages 3 months after

implementation of an excise tax in Berkeley, California. *Am J Public Health*. 2015;105(11):2194–2201.

11. Rudd Center for Food Policy and Obesity. Legislative database. 2015. Available at: http://www.uconnruddcenter.org/legislation-database. Accessed June 13, 2015.

12. Alameda County. Registrar of voters: November 4, 2014—general election results. 2015. Available at: http://www.acgov.org/rov/elections/20141104. Accessed July 1, 2015.

13. The City of Berkeley. Election information: 2014 ballot measures. 2014. Available at: https://www.cityofberkeley.info/Clerk/Elections/Election__2014_Ballot_Measure_Page.aspx. Accessed July 28, 2016.

14. Colchero MA, Popkin BM, Rivera JA, Ng SW. Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study. *BMJ*. 2016;352:h6704.

15. Food taxes and their impact on competitiveness in the agri-food sector. Rotterdam, The Netherlands: European Competitiveness and Sustainable Industrial Policy Consortium; 2014.

16. San Francisco Department of Elections. November 4, 2014 official election results. 2014. Available at: http://www.sfelections.org/results/20141104. Accessed June 17, 2015.

17. Somji A, Nixon L, Mejia P, Azizi M, Arbatman L, Dorfman L. Soda tax debates in Berkeley and San Francisco: an analysis of social media, campaign materials and news coverage. Berkeley, CA: Berkeley Media Studies Group; 2016.

18. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA*. 2014;311(8):806–814.

19. Han E, Powell LM. Consumption patterns of sugar-sweetened beverages in the United States. *J Acad Nutr Diet*. 2013;113(1):43–53.

20. US Census Bureau. 2006–2010 5-year American Community Survey. 2010. Available at: http://factfinder.census.gov. Accessed February 8, 2014.

21. US Census Bureau. 2010–2014 5-year American Community Survey. 2014. Available at: http://factfinder.census.gov. Accessed April 18, 2016.

22. Park S, Pan L, Sherry B, Blanck HM. Consumption of sugar-sweetened beverages among US adults in 6 states: Behavioral Risk Factor Surveillance System, 2011. *Prev Chronic Dis*. 2014;11:E65.

23. McCullagh P, Nelder JA. *Generalized Linear Models*. 2nd ed. London, England: Chapman and Hall; 1989.

24. Berardi N, Sevestre P, Tepaut M, Vigneron A. The impact of a "soda tax" on prices: evidence from French micro data. Paris, France: Banque de France; 2012. Working paper no. 415.

25. Long MW, Gortmaker SL, Ward ZJ, et al. Cost effectiveness of a sugar-sweetened beverage excise tax in the U.S. *Am J Prev Med*. 2015;49(1):112–123.

26. Colchero MA, Salgado JC, Unar-Munguia M, Molina M, Ng S, Rivera-Dommarco JA. Changes in prices after an excise tax to sweetened sugar beverages was implemented in Mexico: evidence from urban areas. *PLoS One*. 2015;10(12):e0144408.

27. Smed S, Jensen JD, Denver S. Socio-economic characteristics and the effect of taxation as a health policy instrument. *Food Policy*. 2007;32(5–6):624–639.

28. Finkelstein EA, Zhen C, Nonnemaker J, Todd JE. Impact of targeted beverage taxes on higher- and lower-income households. *Arch Intern Med*. 2010;170(22):2028–2034.

29. Mytton OT, Eyles H, Ogilvie D. Evaluating the health impacts of food and beverage taxes. *Curr Obes Rep*. 2014;3(4):432–439.

30. Watts RA, Heiss S, Moser M, Kolodinsky J, Johnson RK. Tobacco taxes vs soda taxes: a case study of a framing debate in Vermont. *Health Behav Policy Rev*. 2014;1(3):191–196.

31. Willett WC. *Nutritional Epidemiology*. New York, NY: Oxford University Press; 2013.

32. California Department of Water Resources. Climate data and information for California. 2015. Available at: http://www.water.ca.gov/floodmgmt/hafoo/csc/climate_data. Accessed December 3, 2015.

33. National Policy and Legal Analysis Network to Prevent Childhood Obesity. ChangeLab Solutions. Model sugar-sweetened beverage tax legislation. 2014. Available at: http://www.changelabsolutions.org/publications/ssb-model-tax-legislation. Accessed January 3, 2016.

34. Gortmaker SL, Long MW, Resch SC, et al. Cost effectiveness of childhood obesity interventions: evidence and methods for CHOICES. *Am J Prev Med*. 2015;49(1):102–111.

35. Lynn J. City council votes to allocate "soda tax" revenue to school district, city organizations. *The Daily Californian*. January 20, 2016. Available at: http://www.dailycal.org/2016/01/20/city-council-votes-allocate-soda-tax-revenue-school-district-city-organizations. Accessed July 28, 2016.

EXHIBIT J

Health Policy 121 (2017) 887–894

Contents lists available at ScienceDirect

Health Policy

journal homepage: www.elsevier.com/locate/healthpol

Review

The taxation of unhealthy energy-dense foods (EDFs) and sugar-sweetened beverages (SSBs): An overview of patterns observed in the policy content and policy context of 13 case studies

Luc Louis Hagenaars[a,*], Patrick Paulus Theodoor Jeurissen[a], Niek Sieds Klazinga[b]

[a] Celsus Academy for Sustainable Healthcare, Radboud University Medical Centre', Nijmegen, the Netherlands
[b] Department of Social Medicine, Academic Medical Centre, Amsterdam, the Netherlands

ARTICLE INFO

Article history:
Received 9 November 2016
Received in revised form 5 June 2017
Accepted 28 June 2017

Keywords:
Sugar-sweetened beverages
Food and nutrition policy
Taxes
Obesity
Public policy
Cross-country comparison

ABSTRACT

Taxation of energy-dense foods (EDFs) and sugar-sweetened beverages (SSBs) is increasingly of interest as a novel public health and fiscal policy instrument. However academic interest in policy determinants has remained limited. We address this paucity by comparing the policy content and policy context of EDF/SSB taxes witnessed in 13 case studies, of which we assume the tax is sufficiently high to induce behavioural change.

The observational and non-randomized studies published on our case studies seem to indicate that the EDF/SSB taxes under investigation generally had the desired effects on prices and consumption of targeted products. The revenue collection of EDF/SSB taxes is minimal yet significant. Administrative practicalities in tax levying are important, possibly explaining why a drift towards solely taxing SSBs can be noted, as these can be demarcated more easily, with levies seemingly increasing in more recent case studies.

Despite the growing body of evidence suggesting that EDF/SSB taxes have the potential to improve health, fiscal needs more often seem to lay their policy foundation rather than public health advocacy. A remarkable amount of conservative/liberal governments have adopted these taxes, although in many cases revenues are earmarked for benefits compensating regressive income effects. Governments voice diverse policy rationales, ranging from explicitly describing the tax as a public health instrument, to solely explicating revenue raising

1. Introduction

Over the past few years there has been significant growth in political, public and academic interest in the taxation of energy-dense foods (EDF) and sugar-sweetened beverages (SSB). A growing body of evidence suggests that such fiscal measures have the potential to improve population health [1–4]. Taxation has already been proven effective convincingly for tobacco and alcohol [5]. The additional revenues of these taxes may further increase their attractiveness for policymakers. Not only can this be useful in times of budgetary deficiencies, it can also broaden the financing model of health systems. Currently most countries are highly reliant on income taxes, which is a barrier for employability because increasing the marginal tax rate means increasing personnel costs. The reuse of taxes on unhealthy commodities in the fiscal domain of health can contribute to decreasing income tax dependency [6].

More important is that a tax on EDFs and SSBs can correct for the negative externalities associated to excess consumption of these products, by increasing their prices to their true social costs. It is probable that a case for such a Pigovian tax can be made given the relatively low prices of most EDFs and SSBs and their impact on health and associated medical costs, but it should be noted that quantification of all externalities is still in its infancy. The case for SSBs may be stronger since their inflation-adjusted price has gone down over the past decades whereas prices of fruits and vegetables have gone up [7,8].

Profound policy barriers exist for the uptake of EDF and SSB taxation. Apart from the fact that consumption taxation is regressive [5], which can cause political debate on its own, food taxes also lend themselves to considerable ethical scrutiny, as they touch the base of the debate where protection of the public becomes restriction of personal freedom [9]. Public support for EDF/SSB taxes there-

* Corresponding author at: Maretakstraat 109, 2563 HM, The Hague, the Netherlands.
E-mail addresses: luchagenaars@gmail.com, luc.hagenaars@radboudumc.nl (L.L. Hagenaars), patrick.jeurissen@radboudumc.nl (P.P.T. Jeurissen), n.s.klazinga@amc.uva.nl (N.S. Klazinga).

http://dx.doi.org/10.1016/j.healthpol.2017.06.011
0168-8510/

fore depends on the normative discussion whether a government should only use arguments of health promotion (promoting healthy behaviour) or also of health protection (protecting the population against health dangers) to legitimize the prevention of obesity and diseases related to excess consumption of EDFs/SSBs. In addition, normative preferences also influence whether people find the nature of the intervention appropriate. Since EDF/SSB taxes are a form of collective prevention, they may be found inappropriate as they also affect people who are not at risk for developing obesity or related diseases. Furthermore, these taxes interfere with the interests of the food and soda industry, who exert strong lobby efforts for policies in favour of their interests and are accused to 'puzzle' lay people's nutritional literacy [10]. The food industry contributes to framing obesity as merely a matter of personal responsibility in addition to portraying a lack of physical activity as the primary cause; hence framing strategies that aim to decrease public acceptance for policy measures such as EDF/SSB taxes by stating they infringe on personal freedom and choice [10,11]. Another complication concerns the difficulty to robustly identify the health effects of EDF/SSB taxes. There exist many confounding factors such as substitution to other foods, and external reasons for price fluctuation and dietary behaviour.

Furthermore, health effects may only be visible after several years or even decades. Available evidence comes mainly from modelling studies which do take substitution effects into account, or observational studies of separate episodes of the causal chain linking an EDF/SSB tax to health outcomes [12]. Put simple, a case for such taxes can be made as the available evidence does point to effectiveness, but this evidence is less clear-cut as compared to tobacco and alcohol where addiction components are publicly accepted. A final complexity is that demand for most foods is not very elastic, which means that industry and retailers can shift relatively large parts of price increases onto consumers without enduring large consumption decreases. A meta-analyses conducted by Green, Cornelsen [13] for instance ranges the elasticity of foods in high-income countries from −0,36 to −0,61, with low- and middle income countries having higher price elasticity. Consumers seem more responsive to SSBs, with price elasticity estimates of soft drinks in the USA for instance ranging between −0,79 [14] and −0,86 [15]. Because of relatively inelastic demand experts argue that price increases should be tangible in order to generate meaningful behavioural effects. A sales tax of 20% or an excise of 1 cent per ounce for SSBs are mentioned [16]. However, in the world of policy, compromises must be made. Such high levies and price increases may prove unrealistic in many policy settings, as policymaking not only develops on the basis of puzzling (that is using evidence-based strategies) but also on powering (that is influencing people, in particular to control resources) [17].

1.1. Study objectives

Taxation of unhealthy EDFs and SSBs has potential both as a public health tool but also in the light of health systems' financial sustainability. Yet profound barriers disable its uptake. In the academic literature, attention has mostly been focussed on whether EDF/SSB taxes work, with little or no attention being paid to the policy determinants. We address this paucity of research by providing an overview of patterns observed in the policy content and policy context of 13 case studies. To our knowledge, this is the first study that investigates the policy comparatively from such a wide perspective.

2. Methods

In order to present an overview of patterns observed in the policy content and policy context of EDF/SSB taxes on the basis of systematically collected data, we first identified case studies of which we assume the tax has potential to meaningfully impact dietary behaviour using a purposeful sampling strategy. We therefore only included cases where the level of taxation is relatively high. We then identified a number of possible policy determinants on the basis of the policy analysis models of Walt and Gilson [18] and Leichter [19], key publications related to EDF/SSB taxation, and research group discussions. Subsequently these variables were filled for all cases using scientific literature, government publications where applicable, and grey literature where necessary. We finally consulted experts on individual case studies to validate our information.

2.1. Inclusion rationale

In many countries value added taxes or fiscal import duties apply to standard foods and drinks, but only in few countries unhealthy foods encounter additional taxation. Where unhealthy foods are targeted specifically, levies are often too low to expect meaningful dietary effects since EDFs are relatively price inelastic [1]. In this study we include a number of cases of which we assume that the fiscal policy under investigation has sufficient potential to improve diets, by only including cases that are widely recognized internationally for having tax levies that may according to economic theory be high enough to meaningfully impact dietary behaviour. A World Health Organisation (WHO) European Region paper [20] on the use of price policies to promote healthy diets served as a starting point for our purposeful sampling. It identifies four European cases where the WHO assumes the tax has the specific objective to influence diet, and where the tax is high enough to acknowledge the potential for dietary effects even though the primary purpose is raising revenue. These are the tax on saturated fats in Denmark, the tax on sweets, ice cream and soft drinks in Finland, the public health product tax in Hungary, and the tax on sugar- and artificially sweetened beverages in France. Other widely recognized cases concern the soft drink taxes levied in four Pacific countries (Fiji, Samoa, Nauru, French Polynesia) [21], the SSB tax of Berkeley, California [22], and the tax on sodas and snacks in Mexico [23]. In addition, the recently announced SSB tax in the UK (due for implementation in 2018) is included as the proposed levy is relatively high and the policy is subject to intense public and political scrutiny [24]. The same goes for the tax on sugar- and artificially sweetened beverages of Philadelphia (implemented in 2017) [25]. We finally included the South African SSB tax (due for implementation in 2017) because it was announced explicitly as an instrument to tackle South Africa's obesity crisis while the proposed levy is relatively high [26,27]. In total 13 case studies were included.

2.2. Conceptual framework: exploring the policy determinants of EDF/SSB taxes

We use elements of Walt and Gilson's [18] health policy analysis triangle as a framework to categorize policy elements. The health policy triangle is a highly simplified representation of policy reality, where a policy's content, context and process interact with each other as well as actors involved. We primarily focus on content and context variables. A systematic, comprehensive description of policy processes and the role of actors involved requires thorough investigation of individual cases and empirical data collection, which is outside the scope of this comparative analysis. Fig. 1 emphasizes how we use this model.

We classify context and content elements of EDF/SSB taxes according to the categorization presented in Table 1. Our choice of variables was guided on the basis of key publications including references [5,8–11,16,20–23,28–30], as well as research group discussions. To our knowledge no such framework for compari-

Table 1
Choice of variables.

Policy Content	General characteristics	What commodity/nutrient
		When first levied
		Current status and history of major adaptations
		Stated government rationale
	Technical characteristics	Tax mechanism
		Tax rate
		Are revenues earmarked?
	Impact	(Expected) revenue, absolute & as a share of total tax revenue
		Price pass-through to consumers
		Consumption change of targeted commodity
		Substitution to other commodities
		Health outcomes
Policy context	Situational	Relevance to governmental fiscal priorities
		Prevailing way of framing the problem
		Composition of executive government implementing the policy
	Structural	Obesity among adults & overweight among children
		Level of socioeconomic inequality (GINI-coefficient)
		Share of goods and services taxation, as part of total tax revenue
	Cultural	Room for lobbyists to influence policy (using the corruption perception index of Transparency International [31])
		Public support for healthy lifestyle promotion policy (using the Tobacco and Alcohol control scales [32,33])
	International/ exogenous	Possibility of precedent effects
		Possibility of avoiding tax by cross-border shopping
		Influence of trade agreements

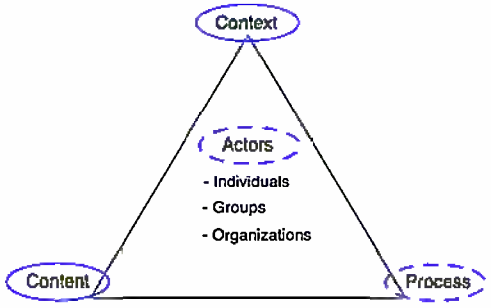


Fig. 1. Health Policy Analysis Triangle, adapted from original of Walt and Gilson [18]. Full circles refer to elements of the policy cases that we analysed systematically; dashed circles refer to elements of the policy cases of which we only describe highlights readily available in the literature.

son hitherto exists. Our approach should therefore be seen as a first attempt to systematically explore the policy determinants of EDF/SSB taxes.

Elements describing the policy content (defined here as the substance of a policy which details its constituent parts) constitute the policies' general and technical characteristics, and the policy impact. Under general characteristics we describe 1) targeted commodities, 2) current status, and 3) the government's stated rationale at the point of introduction. Under technical characteristics we 1) describe tax rates and mechanisms, and 2) whether revenues are earmarked. Under impact we describe 1) the (expected) revenue collected by the tax and how this compares to total tax revenue, 2) price pass-through to consumers and 3) consumption change of the targeted commodities, 4) substitution effects and 5) effects on health outcomes.

We used the categorization method of Leichter [19] for context variables (defined here as systemic factors that may have an effect on the eventual policy content), which identifies situational, structural, cultural and exogenous factors. Situational factors encompass the relevance of the tax in the light of the broader fiscal situation. This is important because taxation policy is mostly dealt with in Ministries of Finance, where fiscal effects are central on the agenda, not necessarily public health [6,21]. The prevailing way of framing the issue is another vital situational element, because framing strategies can influence popular support in lifestyle-related policies [28]. Under this variable we describe elements of the policy process, however we do not assume this makes our process analysis complete. The final situational factor concerns the composition of the government adopting the policy.

Under structural factors we include obesity rates, to analyse the severity of the problem. We do so by comparing obesity rates for adults and children internationally and, where applicable, nationally. (Inter)national comparison is also used to investigate levels of socio-economic inequality. This is important because consumption taxes have regressive income effects, which receives considerable political attention. The share of goods and services taxation as part of total tax revenues is also included, as it indicates taxation traditions. Cultural factors constitute the room for lobbyists to influence policy, and general public support for health promotion policies. With these variables we address population perception. Under exogenous or international variables we explore the chance whether cases may have set a precedent. We assume that a case is most likely to do so if it receives considerable political, public and media attention nationally and globally, while in such cases industry will likely deploy strong efforts to block the policy [11]. The ease of buying the taxed product across the border is explored as well, because this influences the effectiveness of an EDF/SSB tax. Finally, the role of international trade agreements promoting free trade is analysed as this can influence policy content [21,31,32].

2.3. Data collection methodology

The identified variables are presented in Table 1. For policy content, government documents (using mostly budget announcements) form the primary sources of information for both general and technical characteristics as well as the revenue collection variable of policy impact. OECD revenue statistics [33] (excluding the Pacific cases, Berkeley and Philadelphia) describe the share of the tax in total government revenues. When a language barrier did not allow us to look into government documents, scientific and sometimes grey literature was used.

For policy impact, excluding revenue collection, peer-reviewed studies evaluating real world effects on price change, consumer behaviour and health outcomes formed primary sources of information. If peer-reviewed studies were not available, we used grey literature: a report of the Banque de France [34], WHO [20], and casual monitoring in the Pacific countries [21].

For policy context, a number of variables allowed us to use (inter)nationally comparable quantitative indicators. We use WHO data [35] to compare obesity rates among adults for all nations included, and Centres for Disease Control and Prevention data for the US cities of Berkeley and Philadelphia [36,37]. For children's obesity rates, we used OECD data [38] to compare nations. Levels of income inequality, expressed by GINI-coefficient, were compared internationally using World Bank data [39], with Bloomberg data for Berkeley and Philadelphia [40]. OECD data allowed us to compare the actual share of goods and services taxation in total tax revenue [33].

We used the corruption perceptions index of Transparency International [41] as an indicator of the influence of lobbyists in politics, and the tobacco [42] and alcohol [43] control scales as indicators how far European countries' health promotion policies reach [44]. For non-European cases these scales hold no data.

Situational and exogenous/international variables did not allow for the use of quantitative indicators: short elaborations were written on the basis of publications in scientific journals [21,29,31,34,45–49], WHO reports [20,50], two academic books [11,22], government budget speeches in which the tax was announced [24,26,51,52], and transcripts, videos, or government press releases of City Council/Parliament meetings during which the issue was debated [53–55]. Reports of the Banque de France [34], National Heart Forum [56], KPMG [57], and two newspaper article [58,59] were used to fill information gaps for France, South Africa, and Philadelphia.

Data sources, indicators used, and mapping techniques are described in further detail in appendices 1 and 2.

2.4. Expert consultation

Given that interpretation of qualitative data can be prone to researcher interpretation bias, we consulted experts on individual case studies. This served as a factual check of the accuracy and completeness of our information. Experts were found for Denmark, Finland, France, Hungary and the United Kingdom using the OECD network of health committee delegates. The health committee implements OECD's work on health and consists of policymakers of national ministries of health. The lead author of the study of Thow, Quested [21] took up this role for the Pacific cases, and those of the studies of Falbe, Thompson [60] and Cawley and Frisvold [61] for Berkeley. For Philadelphia local policymakers were consulted, and for South Africa we used the open round of the government for receiving commentary on its SSB tax. We did not succeed in consulting an expert for Mexico. A list of consulted experts can be found in Appendix C in supplementary material.

3. Results

The complete results are presented in appendices 1 and 2 in supplementary material. We here point out common patterns observed in the policy content and policy context of EDF/SSB taxes by describing the differences and similarities witnessed in the 13 case studies.

3.1. Policy content

Of all unhealthy foods, the taxation of SSBs seems most appropriate and realistic from a policymaking perspective, as evidenced by a drift of the most recent cases towards solely taxing SSBs. All taxes now target SSBs, with the exception of Denmark's fat tax that has only been in place for one year. In Finland, Hungary, Nauru, French Polynesia, and Mexico also specific foods such as sweets, ice cream, snacks, condiments and confectionery were taxed, with Hungary having the widest scope of products. Finland has slimmed down its scope by only letting SSBs remain as from 2017. France and Philadelphia are peculiar cases; here artificially sweetened beverages are subject to the same tax as SSBs, whereas original policy proposals only included SSBs.

At the point of writing, most taxes were very recently introduced, while they were about to be introduced in the UK (2018) and South Africa (2017). Only Finland has had a very long tradition of taxing unhealthy foods, with a first 'sweets tax' in 1926. The Pacific cases also have a somewhat longer food tax history, with Samoa implementing its first soft drinks tax in 1984 while the others were implemented after 2002. All other cases implemented their taxes after 2011; taxing EDF/SSBs can be seen as a relatively new policy instrument.

In some cases, changes were applied after implementation. Denmark's fat tax was quickly abolished, whereas in Finland additional foods were added to the scope of the tax from 1926 to 2000, before sweets and ice cream were removed, added back, and removed again in 2000, 2010 and 2017 respectively.

Official stated rationales of governments differ, with many but not all explicitly referring to it as a health promotion measure. The governments of Denmark, Hungary, Nauru, French Polynesia, Berkeley, Mexico, the UK, and South Africa officially announced the policy as a health promotion measure. On the other hand, the governments of Finland, France, Fiji, Samoa and Philadelphia more prominently or solely mention revenue raising as the central aim.

Of all tax mechanisms used, most often there is an excise duty that targets a specific product, with inclusion based on composition. Only in Denmark the nutrient itself (saturated fats) was targeted, which seems to have contributed to its abolishment due to administrative complexities. In the other cases, a specific tax rate applies to –for instance- SSBs exceeding a certain amount of sugar per litre, or regardless of how much sugar they contain. Crucial seems to be the accurate demarcation of product categories and practicability in administering tax levying.

The level of taxation is difficult to compare because currencies, the level of competition, and purchasing powers differ. Tax levels should therefore ideally be adjusted for purchasing power, but this was outside the scope of our study. The products subject to taxation themselves differ as well, as does their base line tax rate. Still, we can say that some cases exert a stronger tax pressure than others. Some of the Pacific cases, as well as Berkeley and especially Philadelphia with their SSB taxes of $0.01 and $0.015 per ounce respectively bear relatively high tax levels. France has a relatively low tax level with a rate of €0.11 per 1.5 l.

It is interesting that some recent cases (Berkeley, Philadelphia, UK, and South Africa) portray relatively high levies. A momentum may have been set for SSB taxes encouraging policymakers to use relatively high levies as they draw upon the experience of earlier attempts.

Cases also differ when it comes to the earmarking of the raised revenues. Taxes are not earmarked in Denmark, Finland, Fiji, Samoa, Nauru, Berkeley, South Africa, and Mexico; French Polynesia, Philadelphia, and the UK do specifically earmark revenues for community, health promotion or educational programmes; Hungary and France earmark part of the revenues for healthcare. It should be noted that a fine line exists with implicitly earmarking revenues. Mexico stipulates that it plans to use SSB/EDF revenues for potable water in public schools in low income areas and South Africa plans to use revenues for health promotion, yet both countries do not explicitly earmark. The same goes for Berkeley: an SSB panel of experts which makes recommendations how the City should fund programmes to reduce SSB consumption, was announced in the same Ordinance as the SSB tax. Revenues are not explicitly linked to this panel, because the SSB tax would then have required a supermajority in the referendum deciding upon its faith according to Californian tax law [62].

The revenues raised by the taxes as a share of total tax revenue constitutes less than 1% in all cases, except for Berkeley (4%) and Philadelphia (1.17%). Of the most populated countries (excluding the Pacific countries), Mexico raises most revenues at around 0.38% of total tax revenue. Taxation of EDFs and SSBs therefore probably only forms a small part of larger taxation reforms that aim to decrease income tax rates. Compared with public health expenses, the financial flows are substantial. In the case of Mexico, expected revenues of 12 billion pesos per year make up for around 37% of total spending on preventive care [63].

We found studies investigating the extent to which the EDF/SSB taxes were passed on to consumers through higher shelf prices for the cases of France, Fiji, Nauru, Mexico and Berkeley. Close to all of the tax was passed onto consumers in France and Mexico [34,64]. Fiji and Nauru showed lower but still significant price pass-through [21]. In Berkeley one study, conducted in low income neighbourhoods, found similarly high price pass-through effects [65]. A study looking into retail outlet data of supermarkets and gasoline stations concludes that the tax was fully passed through [66]. However, a study which collected data on a wider scope of drink sizes as well as in more neighbourhoods, came to a lower overall pass-through estimate of 43.1% [61]. Retailers may be more likely to dampen the price effects of taxes by spreading costs to other products or by reducing margins on the targeted products if nearby retailers fall under a jurisdiction without such a tax, such as in the cases of Berkeley and Philadelphia.

Consumption effects were investigated in a number of cases. Evaluations of the Danish case show mixed results on dietary effects, with one study concluding that fats consumption decreased by 10–15% [67] whereas a study based on retail outlet data found a 0.9% decrease [68]. Both studies used a non-experimental design and econometric analyses to investigate retail outlet data, making it difficult to robustly disentangle the tax' impact from other reasons of price changes or aggregate consumption shocks. A study enduring similar limitations investigated the Hungarian public health product tax, and found that sales of included products decreased by 27%, while also observing product reformulation. This study also discovered desirable substitution effects: processed foods consumption decreased by 3.4% while it increased by 1.1% for unprocessed food, with poorer households being more responsive. Bíró [45] therefore concludes that population diet has improved as a result of the public health product tax. A recent WHO impact assessment shows that consumption of the taxed products has decreased as well in the long term, while this study also found that health literacy has improved following the introduction of the public health product tax [69]. In France, an SSB sales drop of 3.3% has been noted, but we found no methodological details of this finding [56]. In Mexico two observational studies were conducted which adjusted for macro-economic variables and pre-existing trends. These found that the monthly sales volume of taxed beverages decreased by 6.1% [70] and 5.1% [71] on average after policy introduction. Moreover, these reductions were considerably higher in lower socioeconomic groups with 9% [70] and 10.2% [71] on average. A larger effect was found in Berkeley. A study with a non-randomized design that examined pre- and posttax changes in SSB consumption in low income areas found a 21% decrease in Berkeley, compared to a 4% increase in the comparison cities of Oakland and San Francisco that did not implement an SSB tax [60]. A study with a similar observational design that did not solely investigate low-income areas concludes that the tax was passed through mostly, but not uniformly, to consumers. Sales of SSBs fell by 9.6%, compared to an increase in sales of 6.9% in comparison cities whereas sales of untaxed beverages in Berkeley rose by 3.5% [72].

Real world evidence on the effects of the policies in terms of health outcomes remains scarce and therefore was not included. This relates to the fact that many confounding factors hinder such analyses, making the bulk of these studies reliant on modelling.

Thus, the available observational and non-randomized studies that evaluated the impact of the taxes in our 13 case studies seem to indicate that consumers did seem to change their behaviour: the consumption of targeted products decreases, and this effects seems larger among lower socioeconomic groups. Also of interest is the observed change in food supply, an often overseen effect of EDF/SSB taxation. Less is known about substitution effects, although Bíró [45] hints that these may be beneficial if taxes are well designed. It remains difficult to pinpoint precisely the effects on health outcomes due to the scarcity of real world evidence.

3.2. Policy context

An enabling situational factor seems to be the fiscal need for extra revenue. In both Denmark and South Africa the tax formed part of a larger revision of the taxation system with the specific aim of expanding the scope of revenue sources, in an effort to decrease income taxes. Budgetary deficits also create fiscal need, like the recent economic crisis (Hungary), downturns in foreign trade (due to World War II and Finnish independence) or import tariff reductions following trade liberalization (Fiji and Samoa). Also in French Polynesia, Berkeley and Mexico extra resources were required, whereas in Philadelphia extra revenue was necessary for certain community and educational programmes held as policy priorities of the Mayor. For France and the UK no direct fiscal need was found, but there may have been an indirect fiscal need given that both countries were under pressure to reduce their budget deficit in the aftermath of the financial crisis.

The way in which the policies were framed differs, although similarities also exist. Industry consistently points to a lack of evidence on the effectiveness of EDF/SSB taxes and therefore seems to pressure governments to not adopt them in the first place, but if they pursue to refer to it as a normal taxation instrument instead of a health protection measure. The latter occurred in France, where Coca-Cola threatened to suspend domestic expansion (which meant a loss of potential jobs) if the policy was labelled a public health policy [56].

In other cases the government forcefully described their tax as a public health tool while specifically naming and shaming food or soda industry as the culprit of the obesity/non-communicable diseases epidemic. This happened in Berkeley, the UK, and to some extent Mexico and South Africa. In Berkeley a broad coalition of community groups expressed a consistent message in their 'Berkeley versus BigSoda' campaign that preceded the policy's referendum. Their message referred to the 'soda industry's inappropriate behaviour'; parallels were drawn with the tobacco industry. Opponents of the tax mainly focussed on 'confusing exemptions' of the tax, and accusations that City Council only aimed to raise revenue, instead of using the (more effective) argumentation that it restricts personal freedom [11,73]. In the UK, celebrity chef Jamie Oliver was in the centre of the debate as an SSB tax advocate. Oliver consistently accused food industry to 'damage children's health' and advocated for a tax as a matter of 'parental responsibility of the government for children's health'. UK government framing follows similar logic, as the tax is named the 'soft drinks *industry* levy' and the government mentions the tax will incentivize industry to reformulate their products by reducing sugar amounts. The earmarking of any upcoming revenues for community school programmes also follows the frame used by Oliver.

Several other cases use a mix of describing the tax as a public health tool as well as a source of revenue, with some cases specifically describing how these revenues enable popular policies. The tax is thus not universally described as a public health instrument. This may be explained because industry has strong lobbying capac-

ity and the means to commence law suits [11]. However, research shows that exposure to strategies used by the food industry to manipulate food choices can generate criticism towards the food and soda industry, and hence support for public policy measures. Ortiz et al. [28] have for instance proven this by exposing people to strategies how the industry develops foods that exploit the biological need for energy (e.g. inclusion of salt and sugar in bread or milk), and uses advertisement and cognitive biases (e.g. increased portion sizes) to stimulate overconsumption. In the cases where the government described the tax specifically as a public health tool, it may have only been able to do so because prominent voices in the public debate emphasized these strategies of the food/soda industry. In cases where the government did not describe the tax as a public health tool, such voices were probably much less present.

The increasing trend of public-private partnerships may also explain why some governments did not describe the tax as a health protection measure. It remains unclear whether (the threat of) these taxes work constructively, or destructively for such partnerships.

A striking finding is that the government implementing the tax in most cases consists of liberal or conservative parties. In more comparable cases such as Denmark, Finland, France and the UK, parties with a centre/right position in the national political spectrum held executive power. Only Fiji, South Africa, Berkeley and Philadelphia had a left-wing party in power. This finding is notable, because the common view is that health policies in general, and lifestyle policies in specific, are more often urged by left-wing parties [44,74]. A logical rationale from a left-wing perspective could be that an EDF/SSB tax urges industry to 'behave better'. However, EDF/SSB taxes can also be explained with a more right-wing rationale: the individual is 'to blame' for societal costs associated to unhealthy food choices, which supports Pigovian taxation as well. In addition, regressive income effects are of less a concern and lowering income taxes may be of transcending importance for the right.

We also observe patterns in the structural factors for our 13 cases, yet we cannot say these are decisive factors due to the small sample size. Obesity rates are higher than global average in all cases. Especially the Pacific countries, Mexico, Philadelphia, the UK, the US and South Africa stand out. Berkeley is peculiar as the obesity rate of Alameda County (in which Berkeley resides) is only 20%, compared to 28.9% USA average.

Given that EDF/SSB taxes are regressive, it is interesting to note that the GINI coefficient is relatively high in most cases (meaning that incomes are relatively unequal).

The same goes for reliance on excise taxes: its share in total revenue is only below OECD average in France and Mexico. Finance departments may have more experience with excise tax technicalities and the demarcation of product groups if governments are relatively dependent on such taxes, which can aid the implementation of an EDF/SSB tax.

Of cultural elements, room for lobbyists as measured by the corruption perceptions index does not appear to influence the policy. The tobacco and alcohol control scales show that the European countries with an EDF/SSB tax also exert relatively big health promotion efforts for tobacco and alcohol. The UK came out on top of the tobacco control scale; France and Finland are amongst the highest-ranking countries in both scales; Denmark and Hungary are in the middle range for both rankings. No data was collected for the non-European cases, but Berkeley for instance has relatively high public support for health promotion efforts as it is known for national leadership in policies such as smoking bans [11].

The precedent that may have been set by our cases differs. The Pacific countries represent very small markets where global media attention is limited, so industry opposition of large multinationals was negligible. The UK, Berkeley and Philadelphia were under bright global media headlights so the stakes for industry were much bigger. The SSB taxes have nevertheless been approved in these cases, so they may have set a policy precedent. Still, situational factors remain vital for the origination of an SSB tax. The Danish fat tax also carried with it the burden of a precedent since it was the first in its kind, which impeded the policy.

The influence of cross-border trade is difficult to measure, but is likely of limited concern in large countries like Mexico and South Africa, and isolated countries such as the Pacific islands and to some extent the UK. It is more of an issue in cases where border crossing requires little effort, like Berkeley and Philadelphia. Still, it remains questionable if this is really a matter of concern since EDFs and especially SSBs are cheap. Buying these products is often a matter of everyday grocery shopping routine, which may be different in products such as cigarettes. Inhabitants also have to make travel expenses to shop across the border. Nevertheless, the cross-border argument can be important in the public debate. In Denmark it was part of the opposition strategy to discourage the tax by virtue of endangering Danish jobs [31]. This claim was not substantiated by rigorous empirical evidence, however [5].

Trade agreements are also important, but they do not necessarily disable EDFs/SSBs taxes as long as products are demarcated adequately, and product inclusion is solely based on composition and not on its (geographic) origin. EU trade agreements for instance forced the Danish fat tax to also include milk and meat, which was not part of the original proposal because these are produced extensively in Denmark. In Finland EU agreements led to the abolishment of the sweets and ice cream tax, as Finland excluded certain domestic products. From these experiences and our content analysis it seems that policymakers run into less demarcation issues when designing an SSB tax compared to an EDF tax.

4. Discussion

Our analysis of 13 case studies on EDF/SSB tax policy content and context determinants has some limitations. First, it requires a systematic literature review to evaluate the effectiveness of EDF/SSB taxes in general. This was out of scope for our explorative study design that primarily focuses on identifying policy patterns in 13 case studies. The impact elements of our policy content analysis therefore are limited with respect to external validity. The number of observational and non-randomized studies that we included to evaluate the effectiveness of the EDF/SSB taxes under investigation also do not cover all 13 cases.

A second limitation concerns the limited depth of the analyses of policy processes and the behaviour of stakeholders involved. For policy analysis these elements are vital, we focussed on generic policy processes though to enhance international comparability [75]. Systematic investigation and comparison of policy processes including stakeholder analysis is recommended to further understand the issue.

A third limitation concerns the lack of an overview of other obesity policies of governments. This is covered to a certain extent by the variables 'prevailing way of framing the problem' and 'healthy lifestyle promotion policy', but it remains difficult to (inter)nationally compare the multitude of obesity policies of governments.

We nevertheless believe the current study pinpoints an interesting development in public health policy, first of all because the more robust observational and non-randomized studies that were available on our 13 case studies [34,45,60,61,64,65,68–70,72,76] seem to indicate that the taxation had the desired effects on prices and consumption of targeted products. Less is known about substitution effects, but the Hungary case shows that substitution to healthier products and product reformulation can occur as well [45].

The proper design of an EDF/SSB tax remains important. Policymakers seem hesitant to include a wide scope of products, possibly because of difficulties in defining sharp boundaries and administering tax levying. This may explain the recent drift towards solely taxing SSBs. Policymakers' confidence seems to grow, since in the most recent cases (Berkeley, UK, Philadelphia) relatively high levies apply to SSBs, which in all probability makes these policies more effective than earlier attempts.

This suggests that SSB taxes are useful new instruments for the public health policy toolbox. However our context analysis shows that these policies do not principally envelop following public health advocacy. Fiscal needs quite often form their foundation instead.

The fact that fiscal needs dominate may explain one of our more striking findings: a conservative or liberal government implemented the EDF/SSB tax in most cases, contradicting the view that health taxes are a left-wing preference only. This view may have its origin in the question whether an EDF/SSB tax provides public protection or restricts personal freedom. Opponents also argue that they are ineffective, hurt small businesses, and cause job losses [11,22]. All of these elements 'skew' the policy to the left. However, other rationales are also at play, such as closing budget loopholes. The revenues raised are often used for benefits that compensate for regressive income effects, either by explicitly earmarking revenues for certain benefits or by doing so more implicitly. This may be important for possible left-wing support.

Left and right-wing political rationales can be used in specific framing strategies: either the industry (left) or individual (right) can be blamed for any negative externalities that follow unhealthy food consumption, although in practice governments seem hesitant to describe the behaviour of the industry and even more so the individual as the reason for their EDF/SSB tax.

It remains somewhat puzzling how EDF/SSB taxation relates to another trend in public health policy: public-private partnerships. The *threat* of a tax can work as a lever to make self-regulation work as it provides incentives for industry to engage in product reformulation [77]. In such scenario the instrument may be supportive for productive public-private partnerships. Yet in the 13 cases that we describe, the threat has turned into reality as the policy is already in place or announced, suggesting that self-regulation was considered insufficient. The question remains whether the instrument jeopardized public-private partnerships in these cases.

5. Conclusions

This study is in our knowledge the first attempt to investigate patterns in the policy content and policy context of taxing unhealthy foods and beverages, using a cross-country comparative methodology with a wide scope of included variables. We recommend scholars to enhance this methodology by adding the comparison of policy process and stakeholder behaviour.

Our study shows how this new policy instrument follows diverse policy rationales. This implies that it can be embraced by diverse ideologies. However, administrative practicalities remain important, which might explain why we note a drift towards solely taxing SSBs as these can be demarcated more easily compared to EDFs. Policy experiences with SSB taxes seem successful, because the observational and non-randomized studies that were available on our cases seem to indicate that the SSB tax generally had the desired effects on prices and consumption. This may also explain why we note an upward drift of SSB levies in recent cases. In SSB taxes the 'puzzling' phase seems to be clear, but there still are issues on 'powering'. In EDF taxes both 'powering' and 'puzzling' remain substantial tasks for policymakers. We therefore conclude by advising policymakers to aim for an SSB tax initially if a window of opportunity for a food or beverage tax arises

Conflict of interest

All authors declare that they have no conflict of interest.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgements

We thank the case-specific experts who validated our information for individual cases. This not only served as a useful fact-check but also enhanced our understanding of the policy dynamics of individual cases.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.healthpol.2017.06.011.

References

[1] Thow AM, Downs S, Jan S. A systematic review of the effectiveness of food taxes and subsidies to improve diets: understanding the recent evidence. Nutrition Reviews 2014;72(9):551–65.
[2] Cabrera Escobar MA, Veerman JL, Tollman SM, Bertram MY, Hofman KJ. Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis. BMC Public Health 2013;13(1):1–10.
[3] OECD. Obesity and the Economics of Prevention: Fit not Fat. Paris: OECD Publishing; 2010.
[4] WHO. Fiscal Policies for Diet and Prevention of Noncommunicable Diseases Technical Meeting Report. Geneva: World Health Organization; 2016.
[5] Sassi F, Belloni A, Capobianco C. The Role of Fiscal Policies in Health Promotion. Paris: OECD Publishing; 2013.
[6] OECD. Fiscal Sustainability of Health Systems: Bridging Health and Finance Perspectives. Paris: OECD Publishing; 2015.
[7] Hsiao A, Wang YC. Reducing Sugar-sweetened Beverage Consumption: Evidence, Policies, and Esugar-Sweetened beverage consumption: evidence, policies, and economics. Current Obesity Reports 2013;2(3):191–9.
[8] Jou J, Techakehakij W. International application of sugar-sweetened beverage (SSB) taxation in obesity reduction: factors that may influence policy effectiveness in country-specific contexts. Health Policy 2012;107(1):83–90.
[9] Green R. The ethics of sin taxes. Public Health Nursing 2011;28(1):68–77.
[10] Nestle M. Food Politics How the Food Industry Influences Nutrition and Health. Berkeley and Los Angeles, California: University of California Press; 2013.
[11] Nestle M. Taking on Big Soda (and Winning). New York: Oxford University Press; 2015.
[12] Eyles H, Mhurchu CN, Nghiem N, Blakely T. Food pricing strategies, population diets, and non-communicable diseases: a systematic review of simulation studies. PLoS Medicine 2012;9(12):e1001353.
[13] Green R, Cornelsen L, Dangour AD, Turner R, Shankar B, Mazzocchi M, et al. The effect of rising food prices on food consumption: systematic review with meta-regression. BMJ 2013;346.
[14] Andreyeva T, Chaloupka FJ, Brownell KD. Estimating the potential of taxes on sugar-sweetened beverages to reduce consumption and generate revenue. Preventive Medicine 2011;52(6):413–6.
[15] Powell LM, Chriqui JF, Khan T, Wada R, Chaloupka FJ. Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand and body weight outcomes. Obesity Reviews 2013;14(2):110–28.
[16] Studdert DM, Flanders J, Mello MM. Searching for Public Health Law's Sweet Spot: The Regulation of Sugar-sweetened Bpublic health law's sweet spot: the regulation of sugar-Sweetened beverages. PLoS Medicine 2015;12(7):e1001848.
[17] Buse K, Mays N, Walt G. Making Health Policy, 2nd ed. Berkshire: Open University Press; 2012.
[18] Walt G, Gilson L. Reforming the health sector in developing countries: the central role of policy analysis. Health Policy and Planning 1994;9(4):353–70.
[19] Leichter H. A Comparative Approach to Policy Analysis: Health Care Policy in Four Nations. Cambridge: Cambridge University Press; 1979.
[20] WHO. Using price policies to promote healthier diets. Copenhagen: World Health Organisation. Regional Office for Europe; 2015.
[21] Thow AM, Quested C, Juventin L, Kun R, Khan AN, Swinburn B. Taxing soft drinks in the Pacific: implementation lessons for improving health. Health Promotion International 2011;26(1):55–64.

[22] Chriqui JF, Young SK. Food, nutrition, and obesity policy. In: Moreland-Russell S, Brownson RC, editors. Prevention, Policy and Public Health. New York: Oxford University Press; 2016.
[23] Carriedo A, Lock K, Knai C, Hawkins B. A qualitative analysis of the design and implementation of the soda tax in Mexico. European Journal of Public Health 2015;25(3):366.
[24] Treasury HM. Budget. London: H.M Treasury; 2016. p. 2016.
[25] City of Philadelphia. Bill No. 160176. Amending Title 19 of The Philadelphia Code, entitled Finance, Taxes and Collections, by adding a new Chapter 19–4100, entitled Sugar-Sweetened Beverage Tax, under certain terms and conditions.: The Council of the City of Philadelphia; 2016.
[26] Republic of South Africa. 2017 Budget People's Guide. Pretoria: National Treasury; 2016.
[27] Republic of South Africa. Q&A: Tax on Sugary Beverages. Pretoria: National Treasury; 2017.
[28] Ortiz SE, Zimmerman FJ, Adler GJ. Increasing public support for food-industry related, obesity prevention policies: the role of a taste-engineering frame and contextualized values. Social Science & Medicine 2016;156:142–53.
[29] Stafford N. Denmark cancels fat tax and shelves sugar tax because of threat of job losses. BMJ 2012:2012.
[30] Chriqui JF, Chaloupka FJ, Powell LM, Eidson SS. A typology of beverage taxation: multiple approaches for obesity prevention and obesity prevention-related revenue generation. Journal of Public Health Policy 2013;34(3):403–23.
[31] Bødker M, Pisinger C, Toft U, Jørgensen T. The rise and fall of the world's first fat tax. Health Policy 2015;119(6):737–42.
[32] Makeisten ja jäätelön vero poistetaan vuonna 2017 [press release]. Helsinki : Finnish Government: Economic Policy Committee2015.
[33] OECD. Revenue Statistics. Public Sector, Taxation and Regulation. Paris : OECD; 2015.
[34] Berardi N, Sevestre P, Tepaut M, Vigneron A. The impact of a 'soda tax' on prices. Evidence from French micro data.: Banque de France. Direction Générale des Études et des Relations Internationales; 2012. Contract No.: 415.
[35] WHO. Global Health Observatory data repository. Obesity (body mass index >= 30) (age-standardized estimate). Data by country. 2014.
[36] CDC. County data indicators. In: Obesity prevalence. Centers for Disease Control and Prevention (CDC); 2012.
[37] CDC. Nutrition, Physical Activity and Obesity: Data, Trends and Maps. Atlanta, GA: Centers for Disease Control and Prevention (CDC); 2015.
[38] OECD. Health at a Glance 2015: OECD Indicators. Paris: OECD; 2015.
[39] World Bank. GINI Index (World Bank Estimate). 2015.
[40] Bloomberg. Bloomberg Best (and Worst) Most Income Inequalitiy: U.S. Cities. Bloomberg L.P.; 2014.
[41] Transparency International. Corruption Perceptions Index 2015: in detail. Berlin: Transparency International; 2016.
[42] Joossens L, Raw M. The Tobacco Control Scale 2013 in Europe. Brussels: Associations of European Cancer Leagues; 2014.
[43] Anderson P, Braddick F, Reynolds J, Gual A. Alcohol Policy in Europe: Evidence from AMPHORA. The AMPHORA project; 2012.
[44] Mackenbach JP, McKee M. Government, politics and health policy: a quantitative analysis of 30 European countries. Health Policy 2015;119(10):1298–308.
[45] Bíró A. Did the junk food tax make the Hungarians eat healthier. Food Policy 2015;54:107–15.
[46] Hawkes N. Sugar tax will double funding for sport in primary schools, says chancellor. BMJ 2016;352(1602).
[47] Hawkes N. Soft drink makers consider legal challenge against sugar tax. BMJ 2016;352.
[48] Juanto L. Excise duties in Finland in a historical perspective. Scandinavian Studies in Law 2003;44:146–59.
[49] Smed S. Financial penalties on foods: the fat tax in Denmark. Nutrition Bulletin 2012;37(2):142–7.
[50] WHO. Public health product tax in Hungary: An example of successful intersectoral action using a fiscal tool to promote healthier food choices and raise revenues for public health. Copenhagen: World Health Organization. Regional Office for Europe; 2015.
[51] City of Philadelphia. The Mayor's Operating Budget in Brief for Fiscal Year 2017. Philadelphia: City of Philadelphia; 2016.
[52] Republic of South Africa. 2016 Budget Speech. Pretoria: National Treasury; 2016.
[53] http://www.acgov.org/rov/elections/20141104/documents/MeasureD-v6.pdf; Alameda County Registrar of Voters. Nov ember 4, 2014 – General Election. Measure D 2014 [Available from:.
[54] City Council of Philadelphia. City Council gives preliminary approval to beverage tax increase Philadelhia; 2016 [cited 2016 June 8]. Available from: http://phlcouncil.com/council-preliminary-approval-to-beverage-tax.
[55] UK Parliament. Public Health England and Jamie Oliver discuss childhood obesity strategy. London: Health Committee, UK Parliament; 2015 [Available from: http://www.parliament.uk/business/committees/committees-a-z/commons-select/health-committee/news-parliament-20151/childhood-obesity-strategy-second-evidence-session-15-16/.
[56] Landon J, Graff H. What is the role of health-related food duties. In: National Heart Forum 2012. London: National Heart Forum; 2012.
[57] KPMG. Taxing your sweet tooth. Effective nudge or economic burden? May 2016.
[58] Oksman O. Philadelphia soda tax passed with help of a new sell: to raise funds for pre-K. The Guardian 2016;(June (20)).
[59] Zillman C. Coca-Cola zero is rebranding itself in the UK as Britain adopts a sugar tax. Fortune 2016 April:20.
[60] Falbe J, Thompson HR, Becker CM, Rojas N, McCulloch CE, Madsen KA. Impact of the Berkeley excise tax on sugar-sweetened beverage consumption. American Journal of Public Health 2016;106(10):1865–71.
[61] Cawley J, Frisvold DE. The pass-through of taxes on sugar-sweetened beverages to retail prices: the case of Berkeley, California. Journal of Policy Analysis and Management 2016;36(2):303–26.
[62] City of Berkeley. Ordinance no. #,### – N.S. Imposing a General Tax on the Distribution of Suger-Sweetened Beverage Products. City Council; 2014.
[63] OECD. Health Statistics. Paris: OECD Publishing; 2015.
[64] Colchero MA, Salgado JC, Unar-Munguía M, Hernández-Ávila M, Rivera-Dommarco JA. Price elasticity of the demand for sugar sweetened beverages and soft drinks in Mexico. Economics & Human Biology 2015;19:129–37.
[65] Falbe J, Rojas N, Grummon AH, Madsen KA. Higher retail prices of sugar-sweetened beverages 3 months after implementation of an excise tax in Berkeley, california. American Journal of Public Health 2015;105(11):2194–201.
[66] Ng SW, Silver L, Ryan-Ibarra S, Induni M, Hamma C, Poti J, et al. Berkeley Evaluation of Soda Tax (BEST) Study Preliminary Findings. Oakland: Public Health Institute & University of North Carolina; 2015. November 3.
[67] Jensen JD, Smed S. The Danish tax on saturated fat –Short run effects on consumption, substitution patterns and consumer prices of fats. Food Policy 2013;42:18–31.
[68] Bødker M, Pisinger C, Toft U, Jørgensen T. The Danish fat tax—Effects on consumption patterns and risk of ischaemic heart disease. Preventive Medicine 2015;77:200–3.
[69] WHO. Assessment of the Impact of a Public Health Product Tax. Budapest: World Health Organization. Regional Office for Europe; 2015.
[70] Colchero MA, Popkin BM, Rivera JA, Ng SW. Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study. BMJ 2016;352:h6704.
[71] Batis C, Rivera JA, Popkin BM, Taillie LS. First-year evaluation of Mexico's tax on nonessential energy-dense foods: an observational study. PLoS Medicine 2016;13(7):e1002057.
[72] Silver LD, Ng SW, Ryan-Ibarra S, Taillie LS, Induni M, Miles DR, et al. Changes in prices, sales, consumer spending, and beverage consumption one year after a tax on sugar-sweetened beverages in Berkeley, California,US: A before-and-after study. PLOS Medicine 2017;14(4):e1002283.
[73] Somji A, Nixon L, Mejia P, Aziz A, Arbatman L, Dorfman L. Soda tax debates in Berkeley and San Fransisco: An analysis of social media, campaign materials and news coverage. Berkeley Media Studies Group; 2016.
[74] Watts RA, Heiss S, Moser M, Kolodinsky J, Johnson RK. Tobacco taxes vs soda taxes: a case study of a framing debate in vermont. Health Behavior and Policy Review 2014;1(3):191–6.
[75] Varvasovszky Z, Brugha R. A stakeholder analysis. Health Policy and Planning 2000;15(3):338–45.
[76] Jensen JD, Smed S. The Danish tax on saturated fat: Short run effects on consumption and consumer prices of fats. Copenhagen: Institute of Food and Resource Economics, University of Copenhagen; 2012.
[77] Meyer N. Political contestation of self-regulation in the shadow of hierarchy. Journal of European Public Policy 2013;20(5):760–76.

EXHIBIT K

HEALTHY BERKELEY PROGRAM EVALUATION

Executive Summary

Prepared by:
John Snow, Inc.
January 2018

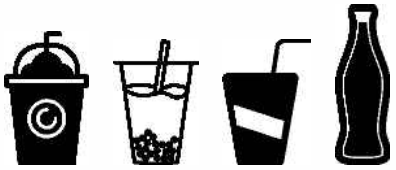
Healthy Berkeley
Public Health Working for You
CITY OF BERKELEY

JSI | HEALTHY COMMUNITIES

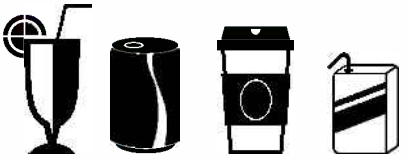
Executive Summary

> *"I think we're making really significant, transformative change, catching young people at a time in their lives when they're starting to make their own decisions about what they put in their body. And questioning what it is they're doing and why, starting to be critical thinkers about food and beverage."*
>
> — *Healthy Berkeley Grantee*

Sugar-sweetened beverages (SSBs), such as soda and juices, increase a person's risk of developing obesity, diabetes, heart disease, and cavities. Youth and communities of color, especially African American and Latino communities, tend to drink more SSBs compared with other groups and have a higher risk of developing disease from drinking SSBs. Unfortunately, low-income and minority communities often lack the access to health care and healthy living that better-resourced communities have. In 2014, the City of Berkeley took a stand against SSBs, becoming the first city in the United States to create and pass a tax on the distribution of SSBs.



Most Americans drink at least one SSB a day.



Berkeley's tax started in 2015. The following year, Berkeley launched the Healthy Berkeley Program to make sure that revenue from the SSB tax returned to Berkeley residents in the form of health programming. In its first year, which took place from July 2016 – June 2017, the Healthy Berkeley Program funded seven community-based programs across six local organizations (grantees). Each grantee worked tirelessly to improve health and reduce inequality among Berkeley residents. These grantees focused on making a positive difference in the lives of Berkeley residents by fostering opportunities to participate in engaging and culturally relevant programs that promoted healthy alternatives to SSBs.

The City of Berkeley Public Health Division (PHD) engaged John Snow, Inc., Healthy Communities (JSI), to evaluate the Healthy Berkeley Program. The goal of the evaluation was to gather information about the activities of Healthy Berkeley grantees during "Year 1" (July 2016 – June 2017).

A Snapshot: The Healthy Berkeley Grantees

Six grantees received awards totaling $1,287,500 to support seven different programs in Berkeley, all with the overarching goals of reducing the consumption of SSBs and associated health outcomes.

1. Berkeley Unified School District

Funded amount: $637,500

- Provided cooking and gardening classes at 17 schools
- Engaged Berkeley children and their families through designing new curricula for classrooms and after school programs and hosting family nights

2. Berkeley Youth Alternatives

Funded amount: $125,000

- Trained youth interns to bring health education to the community and develop their own leadership skills
- Created newspaper articles, social media content, and outreach materials

3. Ecology Center

Funded amount: $115,266

- Trained youth interns to bring health and nutrition education to their peers
- Organized school assemblies and shared information with residents and business owners

4. Healthy Black Families

Funded amount: $245,874

- Trained adult ambassadors to educate their peers on topics including housing, education, health and nutrition
- Created healthy cooking and shopping classes for parents
- Strengthened local partnerships to provide youth with gardening and cooking classes

5. LifeLong Medical Center

Funded amount: $125,000

- Oversaw a mini-grantee program that funded seven new organizations with smaller grants
- Partnered with other grantees to engage residents in Healthy Berkeley programming

6. YMCA – Central Bay Area Diabetes Prevention Program

Funded amount: $51,360

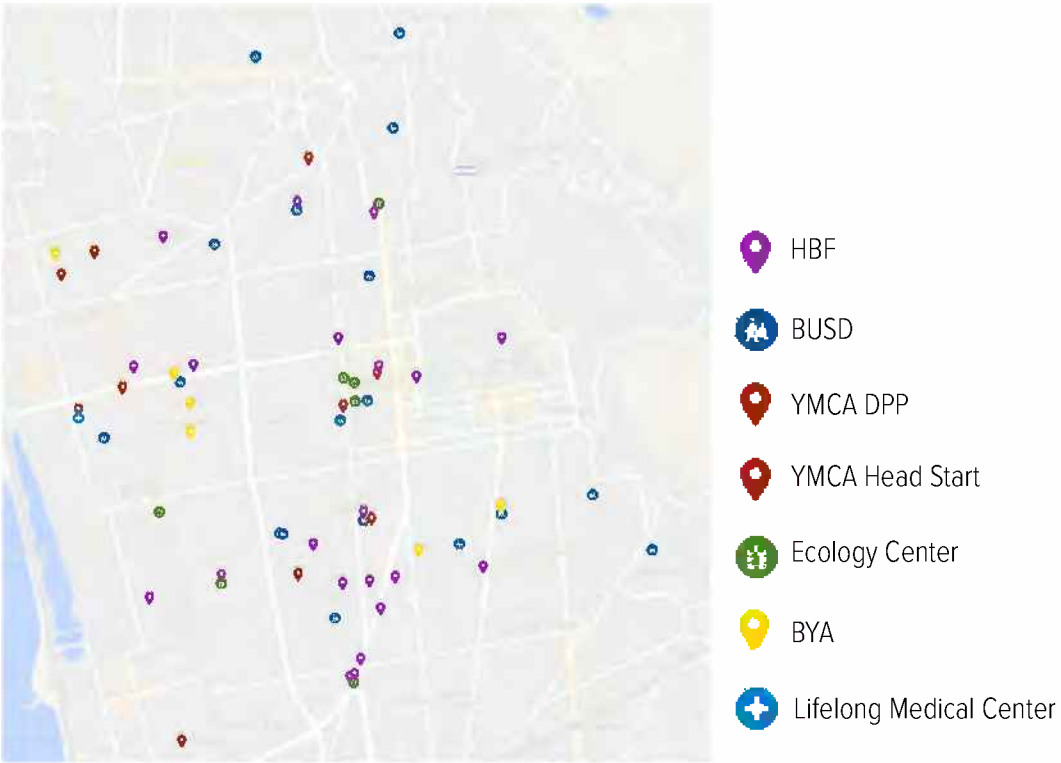
- Provided an evidence-based diabetes prevention program to 99 Berkeley residents, free of charge

7. YMCA – Head Start

Funded amount: $100,000

- Designed a nutrition, dance, and movement program for children at Head Start sites
- Conducted educational workshops for parents and staff

The six grantees reached an estimated 20,000+ people across 88 locations.



Mini-Grantees

The Healthy Berkeley Program included a grant to LifeLong Medical Center to administer smaller "mini-grants," designed to deepen the reach of Healthy Berkeley activities. A total of seven mini-grantees received awards of around $10,000 each.

- **Bay Area Hispano Institute for Advancement (BAHIA)**
  Offered bilingual water education sessions and water bottle distribution, and installed filling stations for families
- **Community Adolescents Nutrition Fitness (CANFIT)**
  Created a widely accessible SSB curriculum for Berkeley organizations
- **Community Child Care Council of Alameda County (4Cs)**
  Developed Healthy Beverage Kits for child care providers' use
- **Inter-City Services Inc.**
  Held a Water Wise health education and awareness contest for youth
- **Multicultural Institute**
  Provided uninsured and underinsured immigrants, day laborers, and families with education and access to health care
- **Options Recovery Services**
  Offered education workshops and water bottle distribution, and installed filling station for people in treatment
- **Youth Spirit Artwork**
  Coordinated the creation of an educational, youth-driven community mural

The mini-grantees expressed that the funding enabled them to support positive change among participants. Among their accomplishments, mini-grantees engaged a range of community members, installed publicly-accessible water fountains, provided hours of workshops in multiple languages, and created educational materials to support local partners in promoting the consumption of healthy beverages. The mini-grantees reported reaching thousands of Berkeley residents, especially underserved communities like non-English speakers and people recovering from addiction.

A Breakdown of Healthy Berkeley's First Year

In one year alone, grantees and mini-grantees encouraged and educated more than 10,000 Berkeley residents through:

- Educating **7,000 BUSD students and parents** with newly developed curriculum focused on SSBs and nutrition
- Distributing more than **1,500 water bottles**
- Organizing dance and music education for more than **700 children**
- Providing **99 people** with a free diabetes prevention program
- Training more than **60 youth and parents** in leadership skills
- Working in **17 schools** across the city
- Completing **8 school-wide assemblies** at Berkeley high schools
- Bringing cooking classes to **8 different locations** in the city
- Coordinating **6 family nights**
- Creating **1 Berkeley-wide SSB awareness campaign**

Together, the grantees implemented more than 130 activities. The majority of activities were educational, with a focus on nutrition and healthy alternatives to SSBs. Examples include nutrition classes for students at school gardens, school assemblies, and outreach at community events.

Other activities involved organizational programming, or enhancements to existing programs and practices. Examples include training youth and parents as peer educators, strengthening partnerships with community agencies, and improving access to water on site.

In addition, all of the grantees adopted organizational policies intended to limit the consumption of SSBs and promote the consumption of water.

In reflecting on their experience, grantees identified several challenges they had overcome:

- Handling unexpected delays, such as bureaucratic processes
- Balancing competing community needs (like residents who felt they could no longer afford to live in Berkeley)
- Respecting traditions and habits that favored SSBs (like having SSBs at family parties)
- Figuring out technical difficulties (like needing better equipment)

The grantees also shared many examples of how their activities were making a difference for participants. They highlighted several overarching accomplishments:

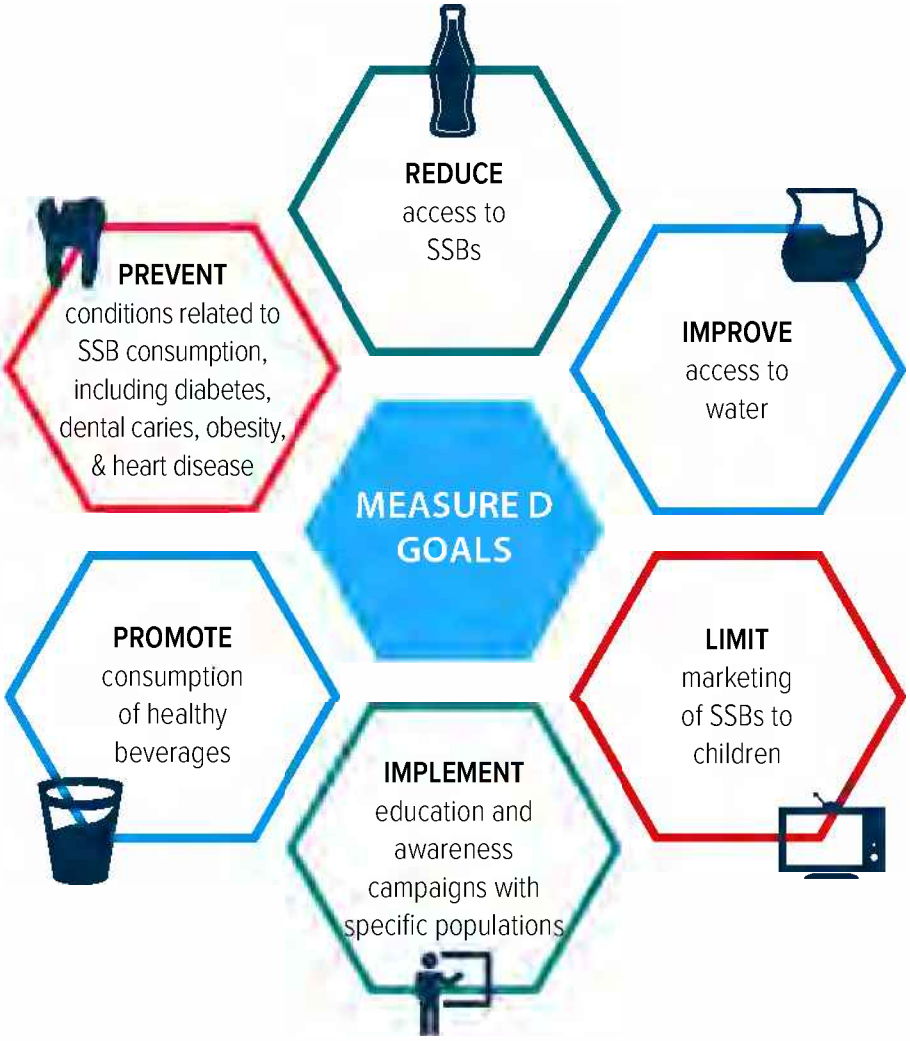
- Engaging traditionally difficult-to-reach communities
- Changing perceptions around SSBs
- Supporting shifts toward healthier behaviors
- Cultivating leadership skills among Berkeley residents

Grantees shared that they could see the impact they were making in the community, even indirectly.

> *"One of the other things that worked really well was being able to place visual postings and materials at all of our sites…One of our janitors had even been paying attention, and not only paid attention to it, but read it, and actually lost weight because the materials made them more aware."*
>
> *— Healthy Berkeley Grantee*

Meeting Measure D's Goals

The goals of the Healthy Berkeley Program were to:



> *"Drinking [soda] impacted me very heavily. Knowing what I know now, it makes me want to change. I know I can't change what happened in the past, but I can change how I start now to the future. Before I came here, I used to drink more soda. But now I drink more water."*
>
> *— Youth Intern*

There was a high degree of alignment between grantees' activities in Year 1 and the Healthy Berkeley goals. Further, grantees largely directed their activities towards communities identified as priorities for the funding.

Looking Forward

> *"We encourage other communities of color throughout California, throughout the nation, to do similar efforts."*
>
> *— Dr. Vicki Alexander, Co-Chair Yes on D Campaign*

In Healthy Berkeley's first year, grantees provided education and other programming, adopted healthy beverage policies, and strengthened partnerships in the community. These activities helped Berkeley residents to build skills, foster relationships with one another, and learn more about healthy living.

The second year of the Healthy Berkeley Program is already underway. As activities progress, opportunities exist to incorporate a greater emphasis on enhancing access to water and shifting the broader conditions in which Berkeley residents live, work, and play. Through continued implementation, the Healthy Berkeley Program has the potential to touch the lives of many residents and pave the way for other cities to pursue similar measures.