JAMA Network Open

Invited Commentary | Nutrition, Obesity, and Exercise

Evaluating the Evidence on Beverage Taxes: Implications for Public Health and Health Equity

Joshua Petimar, ScD; Laura A. Gibson, PhD; Christina A. Roberto, PhD

+ Related article

Author affiliations and article information are listed at the end of this article.

Sugar-sweetened beverage (SSB) taxes have taken off, as evidenced by their implementation in more than 45 countries and several local jurisdictions. In a short time, a large literature has amassed, which Andreyeva et al[1] systematically reviewed and meta-analyzed to inform worldwide tax policy. Not surprisingly, they report that SSB taxes, on average, were associated with significantly higher prices, with 82% of the tax passed through to prices. They also found that these taxes were associated with an average 15% decrease in SSB sales, estimating the price elasticity at −1.59. These sales results were based on 35 estimates from 33 generally high-quality studies that used large data sets with objective measures and little missing data. Perhaps surprisingly, they did not find overall evidence of substitution to sales of untaxed beverages, although some tax evaluations do show this. When such substitution is not observed, it could mean consumers replace SSBs with tap water or do not replace them at all. The studies in the review by Andreyeva et al[1] included evaluations of volume- and sugar-based taxes, different tax amounts and types (excise, sales), diverse populations across many countries and local jurisdictions, and different store types. Although effect size estimates were heterogeneous across these characteristics, the bottom line is the same: SSB taxes are associated with sustained reductions in SSB sales. This kind of sustained behavior change is a highly elusive outcome for dietary interventions.

The authors additionally found an 18% decline in SSB consumption with a 95% confidence interval that just crossed the null ($P = .07$). The point estimate is very similar to that of the sales analysis but much less precisely estimated because of small sample sizes and because consumption measures tend to be far noisier than sales data. Moreover, 75% of the consumption studies were deemed low-quality, and the meta-analysis of the consumption data only included the low-quality studies, excluding 4 medium-quality studies because of missing data. Larger, higher-quality studies of posttax consumption are needed. For example, a recent US study of 86 928 nationally representative adolescents using a difference-in-differences design reported a decrease of 0.81 servings per week (−15% of baseline consumption) following the Philadelphia tax.[2] A beverage tax's impact on SSB consumption can be diminished, however, based on tax design. For example, city-level taxes can induce some individuals to shop across the tax jurisdiction border, which offset a significant proportion of sales declines in several studies. Tax advocates recommend passing SSB taxes at the national or state level to reduce the likelihood of tax avoidance. Additionally, some consumers may substitute SSBs for liquid and powder beverage concentrates, which are excluded from most taxes even though they are used to make sugary drinks. This kind of substitution has been observed in response to some taxes,[3] but few studies have examined this possibility, making it an important question for future research.

The authors describe weak evidence for the association between taxes and BMI, but there is an important caveat. Although all the studies assessing BMI were deemed medium-quality, all evaluated older sales taxes rather than more recent excise taxes. Compared with excise taxes, sales taxes have resulted in smaller price increases and are not incorporated into prices at the point of purchase—they appear on the receipt after purchase, making them less likely to influence behavior. It is still too early to evaluate posttax changes in weight for most current excise taxes given the multifaceted drivers of metabolism and weight gain. Some recent work, however, shows that Mexico's SSB tax was

associated with a 1.3% reduction in the prevalence of overweight or obesity in adolescent girls.[4] This will be an exciting area for future work.

Although there is compelling evidence from high-quality studies that SSB taxes reduce SSB sales, it is extremely important for policy makers to consider the wider impact of these taxes on society. For all the promise of SSB taxes, there are also reasonable concerns about them, most importantly that they may be regressive. Specifically, individuals with lower incomes are more likely to shoulder a greater burden of these taxes because they are more likely to consume SSBs and because price increases would be a greater proportion of their income (for those who continue purchasing SSBs). It is therefore critical that tax proposals include plans to mitigate these costs through equitable investments of tax revenue. Several local US jurisdictions have done this by investing SSB tax revenue in education programs, community infrastructure (eg, parks, libraries), workforce development, and food subsidies, including during the COVID-19 pandemic.[5] These tax designs can provide benefits to lower-income communities while encouraging healthy dietary behaviors. Additionally, proposals that include allocations of tax revenue toward health or education programs may be perceived more favorably by the public,[6] which may make them easier to pass. It is also important to consider that diet-related diseases are not equally distributed across the population. In the United States, for example, lower-income and racial and ethnic minority communities have higher rates of type 2 diabetes and cardiovascular disease. These diseases carry enormous costs to communities that already have limited time and resources. SSB taxes have the potential to reduce such costs if their impact on consumer behavior translates to reductions in chronic disease.

In the absence of empirical evidence, we can consider the costs and benefits from a similar policy: cigarette taxes. Cigarettes and SSBs are both harmful products that are consumed disproportionately by lower-income groups. A large body of evidence on cigarette taxes suggests the short-term costs of cigarette price increases are dwarfed by longer-term economic benefits of reduced smoking, including reduced out-of-pocket health expenses and lost income due to smoking-related diseases.[7] For these reasons, lower-income individuals stand to gain more from these taxes in the long-run. Given the existing racial, ethnic, and socioeconomic disparities in diet-related disease, this may also be true for SSB taxes. The review by Andreyeva et al[1] also indicates that SSB taxes are unlikely to have an adverse impact on the economy and employment, much like tobacco taxes. Although there were some reductions in total grocery sales in 2 studies of a local tax, which could partially be driven by increased cross-border shopping, they found no changes in employment or market return after tax implementation, suggesting SSB taxes are not harming local or national economies.

SSBs are a key contributor to a decades-long surge in diet-related chronic disease and demand policy action. Evidence from this review makes it clear that SSB taxes are an effective tool to reduce SSB purchases and, therefore, have the potential to improve diet and health. However, chronic diseases are complex problems driven by multiple factors. It is difficult, though not impossible, for any one policy to substantially move the needle on population-level health outcomes, but improving dietary choices is a worthy goal in and of itself. Jurisdictions that consider implementing these taxes should continue to design them in consultation with lower-income and marginalized communities. These communities may bear the short-term burden of the tax, even if they reap longer-term benefits, so it is especially important that the revenue is reinvested in ways that support their social and economic needs.

ARTICLE INFORMATION

Published: June 1, 2022. doi:10.1001/jamanetworkopen.2022.15284

Corresponding Author: Christina A. Roberto, PhD, Department of Medical Ethics and Health Policy, Perelman School of Medicine, University of Pennsylvania, 423 Guardian Dr, 1121 Blockley Hall, Philadelphia, PA 19104 (croberto@pennmedicine.upenn.edu).

Author Affiliations: Department of Population Medicine, Harvard Medical School & Harvard Pilgrim Health Care Institute, Boston, Massachusetts (Petimar); Department of Medical Ethics and Health Policy, Perelman School of Medicine, University of Pennsylvania, Philadelphia (Gibson, Roberto).

Conflict of Interest Disclosures: Drs Gibson and Roberto reported receiving grants from Bloomberg Philanthropies outside the submitted work.

REFERENCES

1. Andreyeva T, Marple K, Marinello S, Moore TE, Powell LM. Outcomes following taxation of sugar-sweetened beverages: a systematic review and meta-analysis. *JAMA Netw Open*. 2022;5(6):e2215276. doi:10.1001/jamanetworkopen.2022.15276

2. Edmondson EK, Roberto CA, Gregory EF, Mitra N, Virudachalam S. Association of a sweetened beverage tax with soda consumption in high school students. *JAMA Pediatr*. 2021;175(12):1261-1268. doi:10.1001/jamapediatrics.2021.3991

3. Petimar J, Gibson LA, Yan J, et al. Sustained impact of the Philadelphia beverage tax on beverage prices and sales over 2 years. *Am J Prev Med*. Published online February 24, 2022. doi:10.1016/j.amepre.2021.12.012

4. Gracner T, Marquez-Padilla F, Hernandez-Cortes D. Changes in weight-related outcomes among adolescents following consumer price increases of taxed sugar-sweetened beverages. *JAMA Pediatr*. 2022;176(2):150-158. doi:10.1001/jamapediatrics.2021.5044

5. Krieger J, Magee K, Hennings T, Schoof J, Madsen KA. How sugar-sweetened beverage tax revenues are being used in the United States. *Prev Med Rep*. 2021;23:101388. doi:10.1016/j.pmedr.2021.101388

6. Eykelenboom M, van Stralen MM, Olthof MR, Schoonmade LJ, Steenhuis IHM, Renders CM; PEN Consortium. Political and public acceptability of a sugar-sweetened beverages tax: a mixed-method systematic review and meta-analysis. *Int J Behav Nutr Phys Act*. 2019;16(1):78. doi:10.1186/s12966-019-0843-0

7. Chaloupka FJ, Powell LM, Warner KE. The use of excise taxes to reduce tobacco, alcohol, and sugary beverage consumption. *Annu Rev Public Health*. 2019;40:187-201. doi:10.1146/annurev-publhealth-040218-043816