The Short-Term Impacts of the Philadelphia Beverage Tax on Beverage Consumption

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Introduction: On January 1, 2017, Philadelphia implemented a beverage tax of $0.015/ounce on sugar (“regular”) and sugar-substitute (“diet”) beverages. The purpose of this study was to evaluate the immediate impact of the tax on residents’ consumption of soda, fruit drinks, energy drinks, and bottled water.

Methods: A repeat cross-sectional study design used data from a random-digit-dialing phone survey during a no-tax period (December 6–31, 2016) and a tax period (January 15–February 31, 2017) among 899 respondents in Philadelphia, Pennsylvania, and 878 respondents in three nearby comparison cities. Survey questions included frequency and volume of bottled water and beverages. Outcomes were daily consumption, and 30-day consumption frequency and volume. Propensity score–weighted difference-in-differences regression was used to control for secular time trend and confounding. Covariates were sociodemographics, BMI, health status, smoking, and alcohol use. Analyses were conducted in 2017.

Results: Within the first 2 months of tax implementation, relative to the comparison cities, in Philadelphia the odds of daily consumption of regular soda was 40% lower (OR = 0.6, 95% CI = 0.37, 0.97); energy drink was 64% lower (OR = 0.36, 95% CI = 0.17, 0.76); bottled water was 58% higher (OR = 1.58, 95% CI = 1.13, 2.20); and the 30-day regular soda consumption frequency was 38% lower (ratio of consumption frequency = 0.62, 95% CI = 0.40, 0.98).

Conclusions: Early results suggest that the tax influenced daily consumption of regular soda, energy drinks, and bottled water. Future studies are needed to evaluate longer-term impact of the tax on sugared beverage consumption and substitutions.

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a pressing need to provide information on consumer responses to taxes that have been implemented. Philadelphia’s beverage tax is one of the largest implemented in the U.S. to date, an excise tax of $0.015 per ounce to the cost of beverages (except for products containing more than 50% milk and 100% fruit drinks). If retailers fully pass the tax on to consumers, the tax could increase the beverage price by about 20%. Philadelphia’s tax is the first beverage tax that also extends to diet beverages. Although substituting SSBs with diet beverages may help reduce calorie intake from beverages, recent work has found that artificial sweetener intake may be associated with abdominal obesity, stroke, and dementia.

This study uses newly collected data to describe the immediate impact of Philadelphia beverage tax in residents’ beverage consumption within the first 2 months of implementation.

METHODS

Study Sample

This repeat cross-sectional study uses data from the Drexel University Beverage Choice Research Study, a random-digit-dialing (RDD) sample phone survey administered December 2016–February 2017 (analyzed in 2017). The study was approved by Drexel University IRB under expedited review, and verbal informed consent of subjects was obtained by GfK, a professional survey firm contracted for data collection. The survey included residents in Philadelphia (treatment group: Philly group) and outside of Philadelphia (comparison group: non-Philly group, from the cities of Trenton, New Jersey; Camden, New Jersey; and Wilmington, Delaware). Comparison cities were chosen from the same region as Philadelphia in order to reduce differences based on season/weather, and regional influences on dietary attitudes/preferences.

A probability-based sampling method was used to select phone numbers from the target areas (50% from cell phones). People were eligible if they were aged 18–64 years and lived in Philadelphia or one of the three comparison areas. Calls to landlines used the next-birthday method to select one person from each household. Similar to low absolute response rates found in other RDD samples, the response rate of this survey was 3% (response rate was calculated according to the American Association for Public Opinion Research). Philadelphia respondents roughly matched Census population demographics for sex and race, but were slightly older and of higher SES.

Measures

Beverage questions were based on a modified version of the 15-item Beverage Intake Questionnaire (BEVQ-15), a previously validated questionnaire (details in Appendix Table 2, available online). Analytic outcomes were daily consumption defined as consuming ≥30 times during the past 30 days, 30-day total consumption volume (ounces), and 30-day total consumption frequency. Daily intake was an outcome because it is a commonly used threshold when evaluating SSB consumption as a risk factor for health conditions. A can of sugared soda is equivalent to ≥150 calories—a daily excess calories that have been linked to weight gain. In addition, daily consumption was a reasonable cutpoint for the sample data as there were sufficient numbers of daily SSB drinkers (≥28%) and sugared soda in particular (≥13%). Hereafter, sugared beverages are referred to as “regular” and sugar substitute as “diet”.

The survey collected respondents’ ZIP code and sociodemographic data, including age, sex, race, education, income, height, weight, health status, smoking, and alcohol use. Those variables were included as covariates in analyses. Within the analytic sample, 382 people were missing information on race, education, or income per capita and thus were assigned imputed values for these characteristics based on Census data from their ZIP code of residence.

Definition of tax exposure period. Respondent composition by calendar time and exposure status is summarized in Appendix Table 1 (available online). Anecdotal observations and news coverage noted that most stores appeared to implement beverage price hikes on January 1, 2017 (the day the tax took effect), or very soon thereafter. For this study, the no-tax period (baseline period) was December 6–December 31, 2016, and the tax period (exposure period) was January 16–February 28, 2017. In order to increase the likelihood that surveys represented the tax period, the main analysis excluded the first 2 weeks of tax implementation (January 1–15, 2017). Because of small sample sizes, the main analyses did not exclude the entire month of January. However, different definitions of the exposure period were tested in sensitivity analyses (Appendix Figure 1, available online).

Analytic sample. The survey included 1,514 residents in Philadelphia and 1,253 residents in the comparison cities. Excluded were n=635 surveyed between January 1–15, 2017, and n=355 missing item response for outcomes or covariates (beverage data, sociodemographics along with ZIP code, health status, chronic conditions, smoking, or alcohol use). The final analytic sample included 1,777 respondents: 899 respondents in Philadelphia, PA, and 878 respondents in three nearby comparison cities.

Statistical Analysis

Sociodemographic characteristics and unadjusted outcomes were summarized for Philly and non-Philly samples before and after the policy implementation. An analysis plan was designed to estimate the short-term change in beverage consumption between the no-tax and tax periods, while accounting for (1) secular changes in beverage consumption unrelated to the tax and (2) compositional differences in groups over time (because of the repeat cross-sectional study design). To account for secular changes in beverage consumption, a difference-in-differences regression model was used. Respondents were classified into four groups: Group 1= Philly, no-tax period; Group 2= Philly, tax period; Group 3= non-Philly, no-tax period; and Group 4= non-Philly, tax period (see above for definition of tax exposure period). Changes in beverage consumption before and after the tax were compared in the Philly group and the non-Philly group. Assuming the trend in beverage consumption over time in the Philly group and the non-Philly group would be the same without the tax, the difference-in-differences approach can provide an unbiased estimate of effect of the tax.

To account for compositional differences in groups over time, propensity score weights were created prior to using the
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