

## Table of Contents

-  **1** Poor diet contributes to nearly half of all cardiometabolic deaths. Micha et al. *JAMA*.
-  **2** Sugary drink sales drop in Berkeley one year after implementing tax. Silver et al. *PLoS Med*.
-  **3** Reduction in sales of sugary drinks continues in second year of Mexico tax. Colchero et al. *Health Affairs*.
-  **5** Food price manipulation through taxes and subsidies leads to changes in diet. Afshin et al. *PLoS One*.
-  **6** Cost-effectiveness analysis of taxes and subsidies on diet and health. Cobiac et al. *PLoS One*.
-  **7** Multi-component community campaign leads to reduced sugary drink sales. Schwartz et al. *JAMA*.

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## HEALTH IMPACTS

### Association between dietary factors and mortality from heart disease, stroke, and type 2 diabetes in the United States.

Micha R, Peñalvo JL, Cudhea F, et al. *JAMA*. 2017; 317(9):912-924

**Key Question:** What percentage of cardiometabolic deaths in the United States is attributable to dietary factors, including consumption of sugary drinks?

**Key finding:** Nearly 1 in 2 cardiometabolic deaths is due to poor diet, with 7.4 percent attributable to sugary drinks. That share is higher in younger adults, blacks, and adults with less education.

**Implications:** Continuing efforts to reduce consumption of sugary drinks may reduce the leading causes of death in the U.S., particularly in certain sub-groups.

It is well known that diet contributes to risk of cardiometabolic diseases such as heart disease, stroke and type 2 diabetes.

This study sought to determine exactly how many deaths from these cardiometabolic diseases could be attributed to specific dietary factors, including consumption of sugary drinks. The public health burden of sugary drinks is thought to be particularly high because they are both prevalent and cause metabolic harm, but this is the first study to calculate the exact extent of that burden.

The authors combined dietary data from the National Health and Nutrition Examination Survey (NHANES) from 1999-2002 and 2009-12, with data on causes of death from the National Center for Health Statistics (NCHS) in 2002 and 2012, along with existing estimates of the effect of diet on disease. Ten dietary factors were assessed including sugary drinks, fruits, vegetables, nuts/seeds, whole grains, unprocessed red meats, processed meats, polyunsaturated fat, Omega-3 fats from seafood, and sodium.

Collectively, these dietary factors contributed to 318,656 cardiometabolic deaths in 2012, representing nearly half (45.4 percent) of all cardiometabolic deaths. Sugary drinks accounted for 7.4 percent of all cardiometabolic deaths, and higher percentages of coronary heart disease and diabetes deaths (10.8 and 14.8 percent, respectively.)

The burden of disease due to sugary drinks was much higher for men, younger adults, blacks, and adults with low educational levels. Sugary drinks accounted for more deaths than any other dietary factor among adults less than 44 years old. Sugary drinks also accounted for almost twice as many deaths among blacks (12.6 percent, the leading factor) compared to whites (6.4 percent). Although the percentage of deaths due to sugary drinks declined from 2002 to 2012 overall, it declined less in adults with lower education levels. ■

**Limitations:** Analyses generally relied on published estimates of the effect of diet on disease from observational studies; these may be biased by self-report bias and other factors. National cause-of-death data can also be inaccurate. For example, NCHS data do not differentiate by type of diabetes and may underestimate diabetes as a cause of death.

## POLICY

### Changes in prices, sales, consumer spending, and beverage consumption one year after a tax on sugar-sweetened in Berkeley, California, US: A before and after study. [🔗](#)

Silver LD, Ng SW, Ryan-Ibarra S, et al. *PLoS Med.* 2017. 14(4)

**Key Question:** What impact did a penny-per-ounce sugary drink tax have on sales and consumption of sugary drinks in Berkeley, California?

**Key Finding:** After one year, sales of sugary drinks decreased by 9.6 percent, sales of untaxed drinks went up 3.5 percent (driven largely by increased bottled water sales), and store revenues were not impacted. Findings on consumption were inconclusive.

**Implications:** This study adds to evidence from a prior study (Falbe, et al) in Berkeley and findings in other countries that taxes may lead to a reduction in sales and consumption of sugary drinks. It provides new evidence that store revenues and consumer's grocery bills are not negatively impacted by the tax.

In March 2014, Berkeley became the first US jurisdiction to implement an excise tax on sugary drinks distributed within the city. To evaluate the impact of the tax, Silver and colleagues collected data on prices and sales of taxed and untaxed beverages, store revenues, and sugary drink intake before and after its implementation.

Beverage prices were collected from surveys of 26 stores in Berkeley including supermarkets, corner stores, and drug stores. Sales and revenue data were collected from 15.5 million transactions from two major supermarkets within Berkeley and other Bay Area cities for comparison. Dietary intake data were collected by phone interview from Berkeley residents before (n=623) after (n=613) tax implementation.

On average, 67 percent of the tax was passed on to consumers (resulting in a price increase of 0.67 cents per ounce), but pass-through varied substantially by beverage category and type of store; drug stores and independent corner stores had the smallest change in prices.

Sales (in volume) of taxed beverages went down 9.6 percent in Berkeley and increased 6.9 percent in neighboring cities (compared to predicted sales without the tax). Sales of untaxed beverages increased 3.5 percent in Berkeley, largely driven by a 15.6 percent increase in bottled water sales.

Opponents of soda taxes have argued that they would hurt store revenues, however this study found no evidence that the tax negatively affected earnings of Berkeley supermarkets. Nor did consumers suffer, as grocery bills did not increase in the wake of the tax.

Dietary surveys found a small reduction in sugary drink intake, however this change was not statistically significant, perhaps due to a small sample size and the minimal share of Berkeley residents who consumed sugary drinks at baseline. ■

**Limitations:** The study examined changes in sales within Berkeley and comparison cities, but did not assess whether the changes between cities were statistically significant. Data on store revenues and sales came only from large supermarkets, so the economic impact on small business revenues and sales is still not known (although less than 2 percent of purchases are from small, independent stores). This study was not able to definitively assess changes in consumption; future evaluations of taxes should examine changes in consumption of sugary drinks, no-sugar beverages, and foods to assess impact on overall diet.

## In Mexico, evidence of sustained consumer response two years after implementing a sugar-sweetened beverage tax. [↗](#)

Colchero MA, Rivera-Dommarco J, Popkin BM, Ng SW. *Health Affairs*. 2017; 36(3):564-571

**Key Question:** Have changes in purchases of sugary beverages among Mexican households continued in the second year following implementation of a peso-per-liter tax on sugary drinks?

**Key Finding:** In the second year of the tax, purchases of sugary drinks consistently remained about 10 percent below levels predicted without the tax.

**Implications:** A national tax on sugary drinks may lead to a sustained decrease in sugary drink purchases, especially in low-socioeconomic households.

**T**his study is a continuation of analysis by Cochero and colleagues on the impact of the peso-per-liter (about 10 percent) excise tax on sugary drinks implemented in Mexico on January 1, 2014. The results of this rigorous analysis contradict recent industry claims that sugary beverage purchases had rebounded in 2015.

Authors conducted a longitudinal analysis comparing actual purchases of taxed and untaxed beverages to predicted purchases derived from pre-tax trends in 2012 and 2013. Data on purchases and demographic information came from Nielsen's Mexico Consumer Panel Service and included 6,645 households in 53 cities with populations ranging from 50,000 to 8.9 million. Households were followed for an average of 40.7 months between January 2012 and December 2015. Each household submitted receipts from store purchases, empty packages of food and beverages purchased, and diaries of food and beverage purchases.

On average, actual purchases of taxed beverages were 5.5 percent lower in 2014 than predicted without the tax, and 9.7 percent lower in 2015, for an average reduction of 7.6 percent over 2 years. In contrast, purchases of untaxed beverages increased by an average of 2.1 percent over two years. Declines in sugary drink purchases were greater among low-socioeconomic households both years (-11.7 percent) than among middle- and high-socioeconomic households (-8.8 and -5.1 percent, respectively).

Looking at purchases month-to-month, actual purchases dropped steadily throughout the first year of the tax, reaching a low of 11.6 percent less than predicted by December 2014. In 2015, actual purchases consistently remained about 10 percent below predicted purchases. Thus, while the average *difference* between actual vs. predicted sales was higher in 2015, the rate of declining sales plateaued in the second year. ■

**Limitations:** The data source does not include purchases in rural areas (<50,000 inhabitants) or beverages purchased in locations other than stores. This study does not establish causality; changes in sugary drink purchases could be caused by factors other than the tax alone, such as increased awareness of the health risk from sugary drinks or other government measures related to "junk food" and marketing to children. The data do not provide information on consumption of sugary drinks or health outcomes.

## A case study of the Philadelphia sugar-sweetened beverage tax policymaking process: Implications for policy development and advocacy.

Purtle J, Langellier B, Le-Scherban F. *J Public Health Manag Pract.* 2017 (in press)

As opposed to studying the impact of sugary drink taxes, Purtle and colleagues aimed to assess the policymaking process leading up to the passage of Philadelphia's tax to help guide local health departments and advocates supporting such taxes. The team conducted

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semi-structured interviews with nine key informants who were closely involved in the policymaking process during the months leading up to the city council vote. One of the key lessons to learn from Philadelphia is how to frame the message. Instead of focusing on the potential health impact of the tax, Philadelphia's campaign focused on how revenue from the tax would be used to invest in youth and low-income communities. This non-health framing may have produced greater public support for the tax and avoided contentious debates about the "nanny state" intruding on personal choice. This case study adds to a broad base of non-academic analyses of Philadelphia and other jurisdictions' tax campaigns that will continue to inform future campaigns.

## The prospective impact of food pricing on improving dietary consumption: A systematic review and meta-analysis.

Afshin A, Peñalvo JL, Del Gobbo L, et al. *PLoS One*. 2017; 12(3): e0172277

**Key question:** *What is the impact of food prices on diet and adiposity?*

**Key finding:** *Each 10 percent reduction in the price of healthful foods increased their consumption by 12 percent and was associated with a modest reduction in BMI. Each 10 percent increase in the price of unhealthful foods reduced their consumption by 6 percent.*

**Implications:** *Changes in prices may significantly alter consumption of targeted food items. Price reductions (i.e. discounts) may have a larger effect on consumption patterns and adiposity than price increases (i.e. taxation).*

**M**anipulating food prices through taxes and subsidies has been proposed as an effective strategy for improving people's diets; however, most evidence has been based on cross-sectional modeling studies and has not evaluated the difference in price increases vs. decreases. In this meta-analysis, Afshin and colleagues reviewed only cohort studies to determine the association between changes in food price and changes in dietary consumption or adiposity.

This review included 11 interventional and observational cohort studies that assessed the effect of price decreases and 19 that assessed price increases. Study populations included adults and children, mostly in the US. Settings of price change interventions included cafeterias, supermarkets, vending machines, and farmers markets, and the magnitude of price change ranged from 10-50 percent. Sugary drinks and fast food were most often targeted for price increases, and fruits, vegetables, and low-fat products were targeted for price decreases.

Pooled results found that each 10 percent drop in price increased consumption of healthful foods by 12 percent. Consumption of fruits and vegetables specifically increased by 14 percent. Four studies evaluated the effect of price decreases on adiposity, and pooled results found that each 10 percent decrease in price of fruits and vegetables was associated with a 0.04 lower BMI.

For price increase studies, each 10 percent increase in price decreased consumption of unhealthful foods by 6 percent. The effect was greater on sugary drinks (-7 percent) than on fast food (-3 percent). The association between price increases of unhealthful foods and BMI was negative, but due to the small number of studies that analyzed BMI, this association was not statistically significant. ■

**Limitations:** Differences in interventions and study design could have contributed to the difference in results between price increases and decreases. For example, most studies of price decreases were interventional, included other components such as marketing and education, and had more rigorous evaluation methods compared to price increase studies, most of which were observational cohorts with more methodological limitations.

## Taxes and subsidies for improving diet and population health in Australia: A cost-effectiveness modelling study. [↗](#)

Cobiac LJ, Tam K, Veerman L, Blakely T. *PLoS One*. 2017; 14(2): e1002232

**Key Question:** What is the optimal combination of taxes on unhealthy food and subsidies for healthy food to improve public health?

**Key Finding:** A combination of taxes on unhealthy foods and subsidies for fruits and vegetables led to 470,000 disability-adjusted life years (DALYs) averted and a net cost saving of \$3.4 billion (Australian). A sugar tax alone had the greatest net benefit, while a fruit and vegetable subsidy alone had no net benefit.

**Implications:** This study builds on evidence from other modeling studies by including multiple tax scenarios as well as a subsidy scenario.

Like the study by Afshin and colleagues, Cobiac and colleagues aimed to examine the health impact of unhealthy food taxes and healthy food subsidies. They used a model to simulate the effects of five policy options, individually and in various combinations, on health care costs and disability-adjusted life years (DALYs) over the lifetime of the 2010 Australian population. The policies included taxes on saturated fat, salt, sugar, and sugar-sweetened beverages and a subsidy on fruits and vegetables.

The model simulated changes in dietary patterns caused by the taxes, and then determined the effect of those changes on incidence of diet-related disease (heart disease, stroke, certain cancers, and type 2 diabetes). DALYs averted and health care cost savings were based on changes in disease incidence over the lifetime of the population. They then compared the cost-effectiveness of all 31 combinations of the five taxation and subsidy options to determine the most effective policy package.

Combining all five tax and subsidy policies led to 470,000 DALYs averted and a net cost saving of \$3.4 billion. Individually, all tax policies led to an improvement in population health and net cost-savings. On its own, the sugar tax was most likely to result in the biggest net gains in health (270,000 DALYs averted).

Like Afshin and colleagues, this simulation found that a fruit and vegetable subsidy led to increased consumption of fruits and vegetables; however, it also led to increased sodium and total energy intake, ultimately resulting in no net health benefit to the population. Therefore, this study concludes that fruit and vegetable subsidies alone are not recommended. ■

**Limitations:** Simulation models rely on assumptions about the causal pathway between food pricing, diet, and disease. These pathways are not fully understood or proven, and cannot account for all external factors that may influence the causal pathway over time. This model is based on the Australian population, so outcomes cannot necessarily be generalized to the US or other countries.

## POLICY / COMMUNICATIONS

### Association of a community campaign for better beverage choices with beverage purchases from supermarkets.

Schwartz MB, Schneider GE, Choi YY, et al. *JAMA*. 2017 (in press)

**Key question:** What is the impact of a multi-component community campaign on sugary drink sales?

**Key finding:** Three years after implementation of the campaign, regular soda sales decreased 19.7 percent and fruit drink sales decreased 15 percent while remaining stable in a comparison group (0.8 percent and -0.6 percent, respectively).

**Implications:** This study provides evidence to support policy, system, and environmental changes other than taxes to reduce sugar consumption. This may be helpful for jurisdictions that are unable or unwilling to implement sugary drink taxes.

**A**s many jurisdictions in the US and around the world consider implementing sugary drink taxes to reduce sugar consumption, Howard County, Maryland, took a different approach through its “Howard County Unsweetened” campaign. The campaign was a multi-year, multi-component intervention to reduce sugary drink consumption through policy, system, and environmental changes, not including a sugary drink tax.

Components of the campaign included an online tool to help residents make better beverage choices; organizational efforts such as changes in beverage options in facilities; a media campaign that included digital ads, direct mail, and social media; and county-wide policy changes including improving school wellness policies and restricting beverage options in childcare centers and county-operated facilities.

To evaluate the campaign’s impact, Schwartz and colleagues worked with IRI, a commercial company that analyzes packaged goods sales using scanner data. They used a Matched Market Test method to compare weekly sales of targeted top-selling brands of sugary drinks (regular soda, sports drinks, and fruit drinks) and no-sugar-added drinks (diet soda, 100% juice) before and after implementation of the campaign. Weekly sales data were collected from 15 supermarkets in Howard County and 17 comparison markets in Pennsylvania with similar pre-campaign beverage purchasing patterns. Data were collected for 52 weeks prior to the

start of the campaign (January-December, 2012) and for the first three years of the campaign (January 2013-December 2015).

Sales declined substantially for regular soda (-19.7 percent) and fruit drinks (-15.3 percent) from 2012 to 2015 in Howard County stores while remaining stable in the control stores (0.8 percent and -0.6 percent, respectively). Sales of sports drinks also dropped (-25.1 percent), but the decrease was not significantly different than in control stores (-11.3 percent). Sales of 100% fruit juice, which was not targeted by the campaign, also decreased in Howard County stores (-15.0 percent) significantly more than control stores. ■

**Limitations:** The study only included sales data for top-selling brands of sugary beverages, not smaller companies or other categories of sugary beverages that may be marketed as healthy alternatives, such as teas, flavored waters, and organic sodas. The study did not determine differences in responsiveness to the intervention based on demographic characteristics in Howard County. The population in Howard County was, overall, wealthier, more educated, and more diverse than the comparison group; thus, the residents of Howard County may be uniquely responsive to this type of intervention.

## Trends in beverage consumption among high school students – United States, 2007-2015.

Miller G, Merlo C, Demissie Z, et al. *MMWR*. 2017; 66:112-116

This analysis from the CDC used data from the Youth Risk Behavior Survey (YRBS), a school-based survey on health behaviors among students in grades 9-12. Questions about beverage consumption include milk, 100% juice, and non-diet soda, but do not include other sugary drinks like sports drinks, fruit drinks, or sweetened tea and coffee drinks. Data trends were analyzed by subgroups of grade, sex, race/ethnicity, and income. Consumption of all surveyed beverages decreased significantly between 2007 and 2015: soda dropped from 33.8 percent to 20.4 percent; milk dropped from 43.1 percent to 37.5 percent; and 100% juice dropped from 28.6 percent to 21.6 percent. Overall, trends were similar among sub-groups. Declines in soda consumption are promising and indicate that interventions to reduce soda consumption may be working. However, prevalence is still high in this age group and data from other sources indicate that consumption of other sugary drinks, like sports and energy drinks, are increasing.

Research Watch reviews the evidence on the health effects of sugar and the effectiveness of policy and other interventions to curb consumption to inform sugar reduction activities across the US.

Healthy Food America acts on scientific evidence to drive change in food policy and industry practice, giving people greater control over their health and reducing diet-related illnesses, such as obesity, diabetes, and heart disease.

*This publication was prepared by Jaclyn Konich.*