

Taxation for Reducing Purchase and Consumption of Sugar-Sweetened Beverages: A Systematic Review

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Abstract

Aims: Noncommunicable diseases (NCDs) are common in worldwide and lead to a dramatic rise in mortality. Excess consumption of sugar due to dietary changes can lead to arising calorie intake that contributes to weight gain, adiposity, and NCDs. Taxes, subsidies, and other economic executive policy have a key role in discouraging the consumption of unhealthy food. This study was aimed at a systematic review of recent research evidence about the tax impacts on the purchase and consumption of sugar-sweetened beverages (SSBs). **Materials and Methods:** Five databases, including PubMed, Scopus, Science Direct, CENTERAL, and EMBASE, were systematically searched from 2000 to May 2017. **Results:** Seven studies were included in this review. In six of the seven experimental studies reviewed demonstrated that consumers can be responsive to changes in food and drink prices. Taxing SSBs effectively could decrease food purchases, increasing SSBs price, and reducing consumption. Reducing the consumption of these beverages results in reduced overweight, obesity, and body mass index among populations. **Conclusion:** The current evidence base appears to converge and suggests that the fiscal strategy is likely to reduce purchases of high sugar products at least in the short term and likely can lead to decreasing calorie intake.

Keywords: Soda, soft drink, sugar-sweetened beverages, tax

INTRODUCTION

Noncommunicable diseases (NCDs) are common in worldwide and lead to a dramatic rise in mortality.^[1-3] Globally, the reports show that NCDs are responsible for >38 million deaths per year and 16 million premature mortality as well.^[4] For these reasons, the reduction of NCDs is a sustainable goal for consideration of the Global Action Plan.^[1,2,5] Because of staggering complications of NCDs, health-care policymakers pay attention to confronting and preventive action globally.^[6] Obesity is one of the most serious risk factors for NCDs and is a significant health problem for disability and premature death. Furthermore, previous surveys showed that obesity leads to a deterioration quality of life in the people.^[7] In this context, literatures show that obesity can increase the risk of cardiovascular disease, hypertension, hyperlipidemia, diabetes type 2, sleep apnea, and lead to decreasing life expectancy around 7 years.^[8,9]

Global statistics show that >1.9 billion adults in the range of 18 years and older (39% of the total adult population aged 18 years and over) are placed in the overweight and obesity categories. Of these, over 650 million (13% of the total adult population aged 18 years and over) are in the obese category.^[10] Overweight and obesity are the sixth most substantial known risk factors of disease in the world.^[11]

Genetic factors, inadequate daily activity, and increasing the consumption of unhealthy food (e.g., fast food) are the primary causes of overweight and obesity.^[3,12-15] Socioeconomic status and sociopolitical changes may effect on the incidence and

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prevalence of overweight and obesity by changing these factors.^[16-19]

Dramatically, increment of NCDs and obesity and their complication in the worldwide should be alerted to practitioners and health politicians for the prevention of associated health risks.^[10,20-22]

Excess consumption of sugar due to dietary changes can lead to arising calories intake that contributes to weight gain and adiposity.^[23] Evidence shows that consumption of sugar-sweetened beverages (SSBs) is a risk factor for heart disease, obesity, and diabetes.^[25-27]

The previous studies have shown that one of the factors in food selection is product price, which considers by food/nutrition policymaker for interventions aimed at changing population-level dietary consumption.^[24] Taxes, subsidies, and other economic executive policy have a key role for discouraging the consumption of unhealthy food, which is contained harmful nutrients such as sugar, salt, and saturated fat and encouraging the consumption of healthy foods such as vegetables and fruits.^[25] Taxes can be employed as a sales tax (applied at point of purchase as a proportion of the value of the good) or an excise tax (typically per unit and applied on the sale or production for sale of the good), on a specific nutrient, a combination of nutrients or on a category of food or drink such as SSBs.^[26] A tax on SSBs can have an impact on the consumption of its and follow by a decrease in the prevalence of overweight and obesity.^[27] SSBs taxes as one part of a comprehensive approach for the prevention of overweight and obesity^[28,29] can have extensive potential health and social benefits.^[27,30]

This study was aimed at a systematic review of recent research evidence about the tax impacts on the purchase and consumption of SSBs. This study included everyone who is consumer/purchaser of high sugar beverage in the community setting.

MATERIALS AND METHODS

In order to reproducibility of systematic review present study, its methods and results are reported according to the PRISMA guideline.^[31] Five databases, including PubMed, Scopus, ScienceDirect, CENTRAL, and EMBASE were systematically searched from 2000 to May 2017. Articles in English were considered. Broad search terms were used in the database searches to ensure that all potentially relevant articles entered the screening process. Each database was searched using database-specific indexing terms [Table 1]. After removing duplicates, choosing studies that assessed the effect of the taxation for reducing the purchase and consumption of SSBs conducted. As shown in Figure 1, the selection of related studies conducted by reading titles, abstract, and full text independently by SRS and MB. By considering inclusion and exclusion criteria, related studies were selected. Modeling studies were included because of their high prevalence in this field and the likelihood that such evidence heavily influences policy-making in this area. Studies without English full text

Table 1: Search strategy

Database	Search strategy
PubMed	“Beverages” [Mesh] AND “Taxes” [Mesh]
Scopus	((TITLE-ABS-KEY (beverage) OR TITLE-ABS-KEY (soda) OR TITLE-ABS-KEY (“soft drink*”)) AND (TITLE-ABS-KEY (tax*)))
ScienceDirect	TITLE-ABSTR-KEY (tax*) AND (TITLE-ABSTR-KEY (beverage) or TITLE-ABSTR-KEY (soda) or TITLE-ABSTR-KEY (“soft drink*”))
CENTRAL	“tax* in Title, Abstract, Keywords and (beverage OR soda OR “soft drink*”) in Title, Abstract, Keywords in Cochrane Reviews”
EMBASE	“beverage”:ab, ti OR “soda”:ab, ti OR “soft drink*”:ab, ti AND “tax*”:ab, ti

were removed. The reference lists of selected studies were searched to find any studies that not included in the electronic search. This process adds no more new studies.

For each study, the study’s country, year, population information, study design and intervention, findings, and the key conclusion of the study are summarized in the data Table 2.

Studies were included if they reported on the impact of a change in SSB price on consumption/purchase/sales of high sugar beverages, calorie intake, weight, body mass index, and consumption/purchase/sales by empirical data. Repeated measure panel design-several pretests and posttest of the same group or randomized controlled trials were included.

The study is based on empirical data, excluding reviews, commentaries, editorials, and modeling study. General food taxes were excluded, but if there are separated information, they were entered into this study. Furthermore, studies without English full text were excluded.

We assessed the quality of all studies using a checklist derived from one recent review of the impact of a tax on SSBs study.^[32] The quality criteria assessed were as follows: (i) prospective study of observed behavior; (ii) evaluation of an actual tax (rather than a hypothetical tax); (iii) price linked directly to purchase within same population; (iv) consideration of product compensation (cross-price elasticity); (v) long-run input data across time with sufficient variation in prices used to estimate price elasticities (for experimental studies this included data collected over a period of at least 1 month, for studies using existing data sets on SSB price this included data collected at intervals no <2 months apart for at least 12 months), (vi) valid and appropriate country-specific data, and (vii) reporting of uncertainty around price elasticity estimates. We report on all quality criteria for all studies and rate each study out of seven reflecting one point for each quality measure [Table 2].

RESULTS

As shown in the PRISMA diagram of the present study [Figure 1], from 2042 first search results which 1134 irrelevant of them were

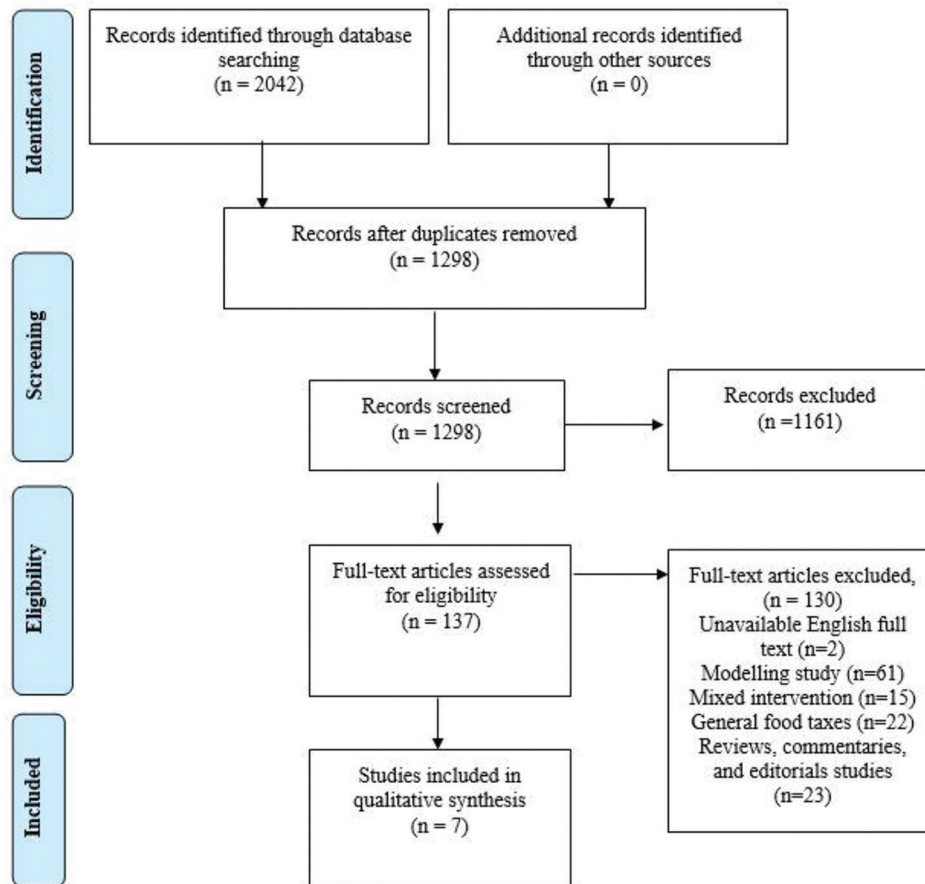


Figure 1: PRISMA diagram

removed in screening steps, 137 full texts were assessed. Finally, seven studies were included in the review as shown in Table 3.

In the study of Colchero *et al.*, the impact of 1 peso/L tax on SSBs by the Mexican Congress as a part of the federal budget in September 2013 was examined.^[33] These taxes became effective on January 1, 2014. The outcome measure was the volume of taxed and nontaxed beverages purchased. The authors conducted a counterfactual difference-in-difference analysis of pretax and posttax trends and found that, relative to counterfactual in 2014 (what would have happened if the taxes were not implemented), the purchase of taxed SSBs decreased by 6% on an average or 12 mL/capita/day. This decrease in the purchase of taxed beverages kept growing through the posttax period, reaching 12% by December 2014. Although all socioeconomic groups saw a significant decline in the purchase of taxed beverages, the effect was the greatest among the poorest households. Meanwhile, the purchase of untaxed beverages (e.g., plain bottled water) has been increased by an average of 4%. This study concluded that the tax on SSBs was associated with fewer purchases of taxed beverages and more purchases of untaxed beverages.

In another study for investigation of this tax (1 peso/L tax on SSBs in Mexico), Colchero *et al.*, estimate changes in sales

of SSBs and plain water by using sales data from the Monthly Surveys of the Manufacturing Industry from January 2007 to December 2015.^[34] They found a decrease of 7.3% in per capita sales of SSB and an increase of 5.2% of per capita sales of plain water in 2014–2015 compared to the pretax period (2007–2013).

In the study of Falbe *et al.*, the impact of the excise tax on SSB consumption in Berkeley, California, which became the first US jurisdiction to implement such a tax (\$0.01/oz) was evaluated.^[35] A repeated cross-sectional design was used to examine changes in pre- to post-tax beverage consumption in low-income neighborhoods in Berkeley versus in the comparison cities of Oakland and San Francisco, California. Consumption of SSBs decreased 21% in Berkeley and increased 4% in comparison cities ($P = 0.046$). Water consumption increased more in Berkeley (+63%) than in comparison cities (+19%; $P < 0.01$). All in all, Berkeley's excise tax reduced SSB consumption in low-income neighborhoods.

In the study of Colantuoni and Rojas, the effect of two tax events: a 5.5% sales tax on soft drinks imposed by the state of Maine in 1991 and a 5% sales tax on soft drinks levied in Ohio in 2003 was investigated by using sales data collected by scanner devices in the two states, where soda taxes were

Table 2: The quality criteria for included studies

Study (years)	The quality criteria							Quality score (out of 7)
	Prospective study of observed behavior	Evaluation of actual tax (rather than hypothetical)	Price linked directly to purchase in same population	Consideration of product compensation	Long-run input data	Valid and appropriate country specific data	Reporting of uncertainty around outcome estimates	
Colchero MA <i>et al.</i> (2016)	1	1	1	0	0	0	1	4
Epstein L <i>et al.</i> (2015)	1	1	1	0	0	0	0	3
Waterlander WE <i>et al.</i> (2014)	1	1	1	1	1	0	0	5
Francesca Colantuoni <i>et al.</i> (2015)	1	1	1	0	0	1	0	4
M Arantxa Colchero <i>et al.</i> (2016)	1	1	1	1	1	0	1	6
Jennifer Falbe <i>et al.</i> (2016)	1	1	1	0	1	1	0	5
Silver LD <i>et al.</i> (2017)	1	1	1	1	1	1	1	7

enacted as well as on neighboring states.^[36] Results suggest that sales tax had a statistically significant impact on the consumption of soft drinks.

In the study of Epstein *et al.*, using a within-subjects design, selected low-nutrient-dense foods (e.g., sweetened beverages, candy, and salty snacks) were taxed, and fruits and vegetables and bottled water were subsidized by 12.5% or 25% in comparison to a usual price condition for 199 female shoppers in an experimental store.^[37] Results showed taxes reduced calories purchased of taxed foods and subsidies increased calories purchased of subsidized foods. However, no overall effect was observed on the total calories purchased. These results suggest that taxes and subsidies can influence energy purchased for products taxed or subsidized, but not total energy purchased.

Silver *et al.* examined 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 by comparison of pretaxation (before January 1, 2015) and first-year posttaxation (March 1, 2015–February 29, 2016). 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.^[38] Posttax 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.

Waterlander *et al.* examined the effects of a price increase on SSBs on beverage and snack purchases using a randomized

controlled design within a three-dimensional web-based supermarket.^[39] The trial contained two conditions: an experimental condition with a 19% tax on SSBs (to reflect an increase in Dutch value added tax (VAT) from 6% to 19%); and a control condition with regular prices, $n = 102$. Results showed that participants in the price increase condition purchased significantly fewer SSBs than the control group ($B = -0.90$; 95% confidence interval = -1.70 – -0.10 L per household per week). There were no significant effects on purchases in other beverage or snack food categories. This means that the higher VAT rate was effective in reducing SSB purchases and had no negative side-effects.

DISCUSSION

The present study that reviewed recent research evidence about the tax impacts on the purchase and consumption of SSBs indicated that tax can be effective in promoting desired dietary changes. The available evidence on sales data from countries that have implemented a tax on SSB also aligns with these findings to suggest that purchases have reduced since the tax was implemented. In six of the seven experimental studies reviewed demonstrated that consumers can be responsive to changes in food and drink prices.

Encourage the consumption of healthy foods such as fruits and vegetables and discourage the consumption of unhealthy nutrients such as salt, sugar, and saturated fat can be implemented with food and nutrition economic policies which employed in some countries. It should be noted that health outcomes associated with food consumption is nonlinear and is influenced by a set of decisive factors that interact at an individual, community, and population level.^[40] On the other hand, human behavior is very different in choices of food and

Table 3: Data extraction table

Study (years)	Study design (data, outcome measure)	Population (n, age)	Setting	Intervention	Findings		Key conclusions
					Measured variables	Differences	
Colchero MA <i>et al.</i> (2016)	Compare sales data before and after tax in 2014 by using the data from January 2007 to December 2015	Manufacturing Industry sale	Mexico	1 peso/L excise SSB tax	Per capita sales of SSB	Differences: 7.3% decrease in 2014-2015 compared to the pretax period (2007-2013)	The tax was associated with a reduction in per capita sales of SSB
Epstein L <i>et al.</i> (2015)	Using a within subjects design/calories purchased/6 weeks Receipts from all foods purchased during the 2 weeks prior to starting the study and throughout the duration of the study were collected to compare	199 females shopper Age: Mean=42.8	Shoppers in an experimental store	Taxed by 12.5% or 25% in comparison to a usual price condition Fruits and vegetables and bottled water were subsidized by 12.5% or 25% in comparison to a usual price condition	Reduced calories purchased of taxed foods	Coefficient: -6.61 CI: -11.94--1.28	Taxes and subsidies can influence energy purchased for products taxed or subsidized, but not total energy purchased
Waterlander WE <i>et al.</i> (2014)	Randomized controlled trial/the purchased quantity (l) of SSBs measured per household per week	102 (control=49, experiment=46) Age: Mean=28	Participants were randomized and purchased groceries on a single occasion at a three-dimensional virtual supermarket	19% tax/every participant was then asked to conduct a typical shop for his/her household for 1 week in the web-based supermarket	Liter SSB per household per week	B=-0.90 CI=-1.70--0.10 L per household per week	This means that the higher value added tax rate was effective in reducing SSB purchases
Francesca Colantuoni <i>et al.</i> (2015)	look at the effect of two tax events: a 5.5% sales tax on soft drinks imposed by the state of Maine in 1991 and a 5% sales tax on soft drinks levied in Ohio in 2003 by using sales data collected by scanner devices in the two states	Two states	USA	5.5% sales tax on soft drinks imposed by the state of Maine on July 16, 1991	Total volume sales	Volume change (SE): -0.02 (0.04)	Neither sales tax had a statistically significant impact on the consumption of soft drinks
M Arantxa Colchero <i>et al.</i> (2016)	Observational study, to test whether the posttax trend in purchases was significantly different from the pretax trend, the authors used a difference in difference fixed effects model	6253 households	Mexico	1 peso/L (approximately a 10% price increase based on 2013 prices)	Purchases of taxed beverages	Decreased by an average of 6% (-12 mL/capita/day) - Decreased at an increasing rate up to a 12% decline by December 2014	The tax on sugar sweetened beverages was associated with reductions in purchases of taxed beverages and increases in purchases of untaxed beverages
Jennifer Falbe <i>et al.</i> (2016)	Repeated cross-sectional design to examine changes in pre- to post-tax beverage consumption in low-income neighborhoods in Berkeley versus in the comparison cities of Oakland and San Francisco, California	990 participants before the tax and 1689 after the tax	USA	\$0.01/oz	Consumption of SSBs	Decreased 21%, increased 4% in comparison cities (P=0.046) Ratio of post- to pre-tax consumption in Berkeley relative to comparison cities (n=2679), Bb (95% CI): 0.76 (0.58-0.995)	Berkeley's excise tax reduced SSB consumption in low-income neighborhoods

Contd...

Table 3: Contd...

Study (years)	Study design (data, outcome measure)	Population (n, age)	Setting	Intervention	Findings	Key conclusions	
Silver LD <i>et al.</i> (2017)	Comparison of pretaxation (before 1 January 2015) and first-year posttaxation (March 1, 2015-February 29, 2016)	Two supermarket chains covering three Berkeley and six control non-Berkeley large supermarkets in adjacent cities, telephone survey of 957 adult, beverage prices at 26 Berkeley stores	USA	One cent per ounce	1. SSB sales 2. Dietary intake	1a. 9.6% decrease compared to estimates if the tax were not in place 1b. Rose 6.9% ($P<0.001$) for nontax state 2b. -19.8% in mean daily SSB intake (g) 2b. -13.3% in mean calories from SSBs 1a. $P<0.001$ 1b. $P<0.001$ 2a. $P=0.49$ 2b. $P=0.56$	1 year following implementation of the nation's first large SSB tax, prices of SSBs increased in many, but not all, settings, SSB sales declined

SSBs: Sugar-sweetened beverages, SE: Standard error, CI: Confidence interval

patterns of consumption, so for implementation a new tax on SSBs, all aspects should be well implemented should be carefully scrutinized and well-planned.

Multispectral strategies such as taxation of unhealthy foods and subsidy of healthy foods are the usual advocated policy for preventive health, promoting diets, and prevent NCDs which had a high cost in the healthcare system.^[41] A public health priority to improve diet is decreasing SSB consumption and applying a tax on SSB can be effective with regard to their high-calorie and low-nutrient content and role in obesity, diabetes, and dental caries.

Rate optimal tax is an important consideration for SSB taxes. While some studies such as Waterlander *et al.* showed the link between existing soda sales taxes and weight outcomes is small.^[39] However, other natural experiment studies have generally determined that soda sales taxes (ranging from 1% to 8%) are too low to effect in any population.^[42-44] Experimental research that suggests the tax level should be at least 20%^[39] or 25%^[45] to be effective.

This suggests that taxing SSBs effectively could decrease their choice in food purchases and increasing SSBs price is a good idea for reducing consumption. Reducing the consumption of these beverages results in reduced overweight, obesity, and body mass index among populations.^[46,47] A minor decreasing in caloric intake will change the weight status of adults who are marginally overweight or obese and can decrease in point prevalence for overweight (-0.045) and obesity (-0.03), particularly in adults that have a high weekly and daily intake.^[48,49]

The complex nature of diet-related behavior and its association with health outcomes such as obesity should be carefully considered in terms of how a tax on high sugar foods and drinks is implemented.^[41]

Modeling studies emphasize the large taxes have good potential and suggest a 20% increasing price or a penny per ounce tax on SSB.^[49-51]

On the other hand, more moderate taxes might also have important positive effects. A review of the price elasticity of demand for major food categories showed that an 8%–10% reduction in purchases when the price of soft drinks would rise by only 10%.^[52] Hence, consideration of price elasticity of SSBs demand is essential before formulating tax policies.

Consideration of the right communication to inform about taxation can be very important to reach to maximize the effects of this policy.^[53] Furthermore, it is very important that studies monitor the long-term effects of fiscal strategies on public health.^[38]

Substitution effect of SSBs tax is another important point that be considered when evaluating its effects. A modeling study showed taxation in SSBs has a positive effect on fruit juice, low-fat milk, coffee, and tea purchases.^[54]

This study also has limitations. First, studies without English full text were excluded, and databases were systematically searched from 2000 to 2017. Due to these filters applied in the study selection, relevant studies might have been excluded. In addition, other factors such as the economic crisis, greater information or awareness of consumers, the influence of different customs in each country, or the effect of the season which can have the effect on SSB purchases, did not consider in the study.

Several problems encountered in the beverage industry-related increase of tax. The beverage industry undoubtedly opposes taxation of sugar drinks. Industry disagreement to these price initiatives generally focuses on political, rather than legal, arguments. Industry reasons, among other things, that taxes will have an unequal and unfair impression on low-income consumers, and may cause losing jobs of workers SBBs manufacture.^[55] Industry also declares that it is unfair to only out the consumption of sugar drinks as a cause of the obesity prevalent and that fiscal policy will not yield significant health benefits.

CONCLUSION

The current evidence base appears to converge and suggests that a fiscal strategy is likely to reduce purchases of high sugar products at least in the short term and likely can lead to decreasing calorie intake.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Alwan A. The world health assembly responds to the global challenge of noncommunicable diseases. *East Mediterr Health J* 2013;19:511-2.
- World Health Organization. Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020. Geneva: World Health Organization; 2013.
- Tee E. Obesity in Asia: Prevalence and issues in assessment methodologies. *Asia Pac J Clin Nutr* 2002;11:S694-701.
- World Health Organization. Global Status Report on Noncommunicable Diseases 2014. Geneva: World Health Organization; 2014.
- Sustainable Development Goals. New York, The United Nations. Available from: <http://www.sustainabledevelopment.un.org/?Menu=1300>. [Last accessed on 2016 Oct 02].
- Peykari N, Hashemi H, Dinarvand R, Haji-Aghajani M, Malekzadeh R, Sadrolsadat A, *et al*. National action plan for non-communicable diseases prevention and control in Iran; a response to emerging epidemic. *J Diabetes Metab Disord* 2017;16:3.
- Jafari-Adli S, Jouyandeh Z, Qorbani M, Soroush A, Larijani B, Hasani-Ranjbar S. Prevalence of obesity and overweight in adults and children in Iran; a systematic review. *J Diabetes Metab Disord* 2014;13:1-10.
- Ramachandran A, Snehalatha C. Rising burden of obesity in asia. *J Obes* 2010;2010. pii: 868573.
- Hasani-Ranjbar S, Jouyandeh Z, Abdollahi M. A systematic review of anti-obesity medicinal plants – An update. *J Diabetes Metab Disord* 2013;12:28.
- World Health Organization. Obesity and Overweight factsheet from the WHO. Geneva: World Health Organization; 2017.
- Ezzati M, Lopez AD, Rodgers A, Vander Hoorn S, Murray CJ; Comparative Risk Assessment Collaborating Group. Selected major risk factors and global and regional burden of disease. *Lancet* 2002;360:1347-60.
- Lal A, Moodie M, Ashton T, Siahpush M, Swinburn B. Health care and lost productivity costs of overweight and obesity in New Zealand. *Aust N Z J Public Health* 2012;36:550-6.
- Tavakkoly Bazzaz J, Shojapoor M, Nazem H, Amiri P, Fakhrazadeh H, Heshmat R, *et al*. Methylentetrahydrofolate reductase gene polymorphism in diabetes and obesity. *Mol Biol Rep* 2010;37:105-9.
- McCarthy MI. Genomics, type 2 diabetes, and obesity. *N Engl J Med* 2010;363:2339-50.
- Marinou K, Tousoulis D, Antonopoulos AS, Stefanadi E, Stefanadis C. Obesity and cardiovascular disease: From pathophysiology to risk stratification. *Int J Cardiol* 2010;138:3-8.
- Carreira H, Pereira M, Azevedo A, Lunet N. Trends of BMI and prevalence of overweight and obesity in portugal (1995-2005): A systematic review. *Public Health Nutr* 2012;15:972-81.
- Hasani-Ranjbar S, Nayebi N, Larijani B, Abdollahi M. A systematic review of the efficacy and safety of herbal medicines used in the treatment of obesity. *World J Gastroenterol* 2009;15:3073-85.
- Sobhani SR, Keshtkar A, Dorosty AR, Farhadnejad H, Pouraram H. The association between dietary pattern and weight status in school-aged children: A cross-sectional study. *J Compr Ped* 2017;8:e56063.
- Eini-Zinab H, Sobhani S. Contemporary socioeconomic changes, food and nutrition systems, and sustainable diets. *Iran J Nutr Sci Food Technol* 2018;13:129-38.
- Sobhani R, Dorosti AR, Keshtkar A, Ramazani AH, Pouraram H. Association of school children's overweight and obesity with maternal overweight and obesity in the rural areas. *Sci J Kurdistan Univ Med Sci* 2015;20:76-84.
- Sobhani S, Pouraram H, Keshtkar A, Dorosti A. Major dietary patterns and their association with weight status in school age rural children of Bijar, Kordestan. *Iran J Nutr Sci Food Technol* 2016;11:35-46.
- Sobhani S, Sheikhi M, Eini-Zinab H, Mohammadi-Nasrabadi F. Compliance of Iran's National Nutrition and Food Security Policy (2012-2020) with components of sustainable diets framework. *Iran J Nutr Sci Food Technol* 2018; 13:153-60.
- Roberts KE, Eells LJ, McGowan VJ, Machaira T, Targett VC, Allen RE, *et al*. A rapid review examining purchasing changes resulting from fiscal measures targeted at high sugar foods and sugar-sweetened drinks. *Nutr Diabetes* 2017;7:302.
- World Health Organization. Global Strategy on Diet, Physical Activity and Health. Geneva: World Health Organization; 2004.
- 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;13:1072.
- Mytton O. Time for a sugary drinks tax in the UK? *J Public Health (Oxf)* 2015;37:24-5.
- Barroy H, Sparkes S. Assessing Fiscal Space for Health Expansion in Low-and-Middle Income Countries. Geneva: World Health Organization; 2016.
- Wagenaar AC, Salois MJ, Komro KA. Effects of beverage alcohol price and tax levels on drinking: A meta-analysis of 1003 estimates from 112 studies. *Addiction* 2009;104:179-90.
- Hellowell M, Smith KE, Wright A. Hard to avoid but difficult to sustain: Scotland's innovative health tax on large retailers selling tobacco and alcohol. *Milbank Q* 2016;94:800-31.
- Wright A, Smith KE, Hellowell M. Policy lessons from health taxes: A systematic review of empirical studies. *BMC Public Health* 2017;17:583.
- Moher D, Liberati A, Tetzlaff J, Altman DG; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med* 2009;6:e1000097.
- Backholer K, Sarink D, Beauchamp A, Keating C, Loh V, Ball K, *et al*. The impact of a tax on sugar-sweetened beverages according to socio-economic position: A systematic review of the evidence. *Public Health Nutr* 2016;19:3070-84.
- 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.
- Colchero MA, Guerrero-López CM, Molina M, Rivera JA. Beverages sales in Mexico before and after implementation of a sugar sweetened beverage tax. *PLoS One* 2016;11:e0163463.
- 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;106:1865-71.
- Colantuoni F, Rojas C. The impact of soda sales taxes on consumption: Evidence from scanner data. *Contemp Econ Policy* 2015;33:714-34.
- Epstein LH, Finkelstein E, Raynor H, Nederkoorn C, Fletcher KD, Jankowiak N, *et al*. Experimental analysis of the effect of taxes and subsidies on calories purchased in an on-line supermarket. *Appetite* 2015;95:245-51.
- 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 Med* 2017;14:e1002283.
- Waterlander WE, Ni Mhurchu C, Steenhuis IH. Effects of a price increase on purchases of sugar sweetened beverages. Results from a randomized controlled trial. *Appetite* 2014;78:32-9.
- Epstein LH, Jankowiak N, Nederkoorn C, Raynor HA, French SA, Finkelstein E, *et al*. Experimental research on the relation between food price changes and food-purchasing patterns: A targeted review. *Am J Clin Nutr* 2012;95:789-809.
- Thow AM, Downs S, Jan S. A systematic review of the effectiveness of food taxes and subsidies to improve diets: Understanding the recent evidence. *Nutr Rev* 2014;72:551-65.

42. Fletcher JM, Frisvold D, Tefft N. Can soft drink taxes reduce population weight? *Contemp Econ Policy* 2010;28:23-35.
43. Kim D, Kawachi I. Food taxation and pricing strategies to “thin out” the obesity epidemic. *Am J Prev Med* 2006;30:430-7.
44. Mytton OT, Clarke D, Rayner M. Taxing unhealthy food and drinks to improve health. *BMJ* 2012;344:e2931.
45. Giesen JC, Havermans RC, Nederkoorn C, Jansen A. Impulsivity in the supermarket. Responses to calorie taxes and subsidies in healthy weight undergraduates. *Appetite* 2012;58:6-10.
46. Finkelstein EA, Zhen C, Bilger M, Nonnemaker J, Farooqui AM, Todd JE, *et al.* Implications of a sugar-sweetened beverage (SSB) tax when substitutions to non-beverage items are considered. *J Health Econ* 2013;32:219-39.
47. Barquera S, Hernandez-Barrera L, Tolentino ML, Espinosa J, Ng SW, Rivera JA, *et al.* Energy intake from beverages is increasing among Mexican adolescents and adults. *J Nutr* 2008;138:2454-61.
48. Smith TA. *Taxing Caloric Sweetened Beverages: Potential Effects on Beverage Consumption, Calorie Intake, and Obesity.* Washington D.C: DIANE Publishing; 2010.
49. Fletcher JM, Frisvold DE, Tefft N. The effects of soft drink taxes on child and adolescent consumption and weight outcomes. *J Public Econ* 2010;94:967-74.
50. Andreyeva T, Chaloupka FJ, Brownell KD. Estimating the potential of taxes on sugar-sweetened beverages to reduce consumption and generate revenue. *Prev Med* 2011;52:413-6.
51. Brownell KD, Frieden TR. Ounces of prevention – The public policy case for taxes on sugared beverages. *N Engl J Med* 2009;360:1805-8.
52. 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;100:216-22.
53. Lacañilao RD, Cash SB, Adamowicz WL. Heterogeneous consumer responses to snack food taxes and warning labels. *J Consum Aff* 2011;45:108-22.
54. Dharmasena S, Capps O Jr. Intended and unintended consequences of a proposed national tax on sugar-sweetened beverages to combat the U.S. obesity problem. *Health Econ* 2012;21:669-94.
55. 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;361:1599-605.