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COMMENTARY

Potential Impact of Sweetener Input Tax on Public Health

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1 Introduction

Obesity is a complex health issue in the United States of America (USA) and around the world. In USA, obesity affects a 78.6 million population at an estimated annual medical cost of about US$147 million in 2008 [1]. In 2011, approximately 63.2% of the US population is either obese or overweight, compared with 64.8% in 2016 [2].[1] The percent of US adolescents who are either obese or overweight has increased from 24.1% in 2001 to 29.9% in 2015 [2]. During the 2007–15 period, the percent of US adolescents that are obese or overweight has slightly increased from 28.4% in 2007 to 29.9% in 2015 [2]. During the same period, the percent of US adolescents who consumed sugary drinks at least once a day has decreased from 33.8% in 2007 to 20.4% in 2015 [2].

The sugar sweetened beverage (SSB) tax has become a popular health policy tool among public representatives to reduce the intake of SSBs. Since 2014, the SSB tax has gained momentum. The first SSB tax in North America was implemented in Mexico in January 2014. Since then, several US cities have enacted a local-level SSB tax [3].[2]

The statistical figures (of obesity and sugary drinks consumption) presented earlier show a contrasting relationship between the obesity/overweight rates and sugary drink consumption in US adolescents. This raises an important question: *Is a soda or a SSB tax enough to have a positive impact on the obesity and overweight health problems around the world, or do we need to complement the SSB tax with other strategies, which together could impact the public health?*

Although there are multiple factors responsible for the obesity epidemic, this article focuses on one type of food consumption, that is, sweetener consumption,[3] and the different strategies in implementing a successful sweetener input tax to an extent that it could have an impact on public health. The literature suggests that obesity/overweight is a complex health problem owing to several factors, including individual behavior (overeating and lack of physical activity), genetics, type of food consumption (marketing and promotion), and lack of public health education [5]. To reduce added sugars in consumers' diet, several approaches have been proposed, including a SSB tax, nutrition labeling, alteration of government agricultural subsidies, and a cap-and-trade market for added sugars. [6]. A recent report from the World Health Organization also recommends the policy to "implement an effective tax on sugar-sweetened beverages" along with other recommendations [7].

Most previous studies have focused on taxing only SSBs/sugary drinks, which in the case of USA account for only 39% of total sweetener consumption [3, 8–10]. Essentially, the SSB tax is a tax on only 39% of the total added sweeteners consumed in USA.

Therefore, this article proposes three different strategies for an effective and comprehensive health policy with a goal to reduce excess sweetener consumption to an extent that it could have an impact on public health. Strategies include (1) a tax on sweeteners as inputs instead of a tax on final products (outputs) such as sugary drinks/SSBs, (2) specifying added sugars in the nutrition facts label with %Daily Value (%DV) based on the American Heart Association's (or based on similar health organizations in individual countries) recommended sweetener consumption per capita, per day, and (3) educating the public regarding the negative health consequences of consuming excess sweeteners.

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[1] According to the Centers for Disease Control, an individual is considered obese if his or her body mass index is greater than 30 kg/m^2, and overweight if the individual's body mass index is between 25 and 30 kg/m^2.

[2] For more information on similar taxes worldwide, refer to [3].

[3] In this article, the reference to the term "sweeteners" represents caloric sweeteners, including sugar (from cane and beet), high fructose corn syrup, and glucose, which together account for about 93% of total US caloric sweetener consumption [4]. While low and non-

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2 Strategies

2.1 Taxing All Products Containing Added Sweeteners at the Input Level

As mentioned earlier, many previous studies have focused on SSB taxation, although SSBs account for only 39% of total added sugars in USA [10]. In addition, the SSB tax ignores the impact of consuming other sugar-containing products other than SSBs (e.g., ice cream, cereals, and bakery goods) that constitute the other 61% of total added sugars consumed in USA. Therefore, the goal of a sweetener tax policy should focus on: (1) the amount of sweetener intake by an individual or the amount of sweetener used as an input for making a final output (e.g., SSBs and ice cream) and (2) taxing sweeteners at the input level of all products containing sweeteners (not just SSBs).

This raises an important question about how much the sweetener input tax should be. The answer can be derived by evaluating the information about the current level of per-capita sweetener consumption as well as the recommended level of sweetener consumption in each region/country in question. Recommended levels or maximum levels of sweetener consumption vary in different countries. For example, the American Heart Association recommends maximum daily sweetener consumption levels of up to 6 teaspoons (100 calories) for women and 9 teaspoons (150 calories) for men [11]. It is important to note that input supply and demand elasticities and substitution effects among different sweeteners play a key role in the amount of tax to be implemented on each type of sweetener. The US Food and Drug Administration proposed that the added sugar consumption should not exceed 10% of the daily calorie intake (e.g., added sugars should be no more than 200 calories in a 2000-calorie diet) [12]. Other countries have different standards with respect to limiting the added sugars in their diet [13].

2.2 Nutrition Facts Labeling

Until recently, there was no discussion of including %DV for added sugars in the nutrition facts label of food products in USA. In the previous nutrition facts label, trans-fats, sugars, and protein were not labeled with %DV. Specifying just the quantity of added sugars on the nutrition facts label does not serve the purpose because the consumer may not know if that quantity (listed) is a high or a low consumption level compared to the recommended level.

Recently, the Food and Drug Administration has proposed changes for the nutrition facts label. Three key changes in the proposed nutrition facts label include (1) calories per serving would appear in a larger font size compared with the earlier nutrition facts label, (2) the actual amounts of nutrients (i.e., vitamin D, calcium, iron, and potassium) per serving of the food product would be listed, and (3) added sugars would be included in the category of total sugars along with its %DV. For example, the new Food and Drug Administration nutrition facts label contains "*Includes X g Added Sugars*" under the "*Total Sugars*" category along with %DV for added sugars [14]. All these changes in the nutrition facts label are steps in the right direction to better inform the consumer and could be emulated by other countries.

2.3 Public Health Education

Educating the public about the consequences of consuming foods that contain excess sweeteners is a valuable tool to minimize their consumption of sweeteners. It is well known that the success of passing the SSB tax in USA through a public vote was partly owing to the influence of educational efforts by various pro-SSB tax organizations. Similar efforts are needed to educate the public about the consequences of excess sweetener consumption, which could lead to other indirect health complications (via obesity) including type 2 diabetes mellitus and cardiovascular diseases. A recent study has found that public health education and nutrition knowledge are significant in consuming healthy foods/groceries irrespective of an individual's income level [15].

In general, educating the public about the health consequences of excess consumption of a food category may be difficult for several reasons. First, in general, unhealthy foods are cheaper and contain significant amounts of added sugars (and sodium), compared with healthy foods. Second, better accessibility to healthy foods may or may not play a vital part in minimizing the consumption of unhealthy foods. For example, while one study indicated that better accessibility to healthy foods may shift the individual's eating pattern in favor of healthy foods, [16] another study indicated that accessibility to healthy foods may not be enough to reduce obesity [17]. Finally, it is important to highlight the fact that the consumption of diversified food that provides sufficient quantities of carbohydrates, fat, protein, and vitamins is important, but sufficient care must be taken not to exceed the daily calorie requirement of 2000 calories per capita per day.

Footnote 3 (continued)

caloric sweeteners represent less than 2% of total US sweetener consumption [4].

3 Challenges

Many challenges may negate the effect of a sweetener tax in reducing excess sweetener consumption. One example is that sweetener consumption accounts for only a small share of the total consumer budget, particularly in developed countries. In most developed countries, the percent of total expenditure that is spent on all foods in the diet is significantly low, accounting for less than 10%. For example, in USA, the share of the total consumer budget spent on food is 6.7% [18]. Of the total expenditure on food in a developed country, the expenditure share on sweeteners of a representative consumer is much lower, which may not affect a consumer's diet behavior, nor have a significant positive impact on public health. In contrast, a sweetener input tax may have a positive impact on public health in developing and under-developed countries because the share of the total consumer budget spent on food and sweeteners is higher compared with developed countries. Therefore, a multi-pronged strategy is required to achieve the goal of reducing sweetener consumption and obesity in different countries through input and output taxes.

Another major challenge could be strong opposition from sugar lobbies against any imposition of the input and output taxes. In USA and elsewhere, the sugar lobbies along with corporate bodies are very influential in opposing any health policy that is aimed at reducing the sweetener consumption.

4 Conclusions

Most studies have focused on taxing SSBs, which account for a minor share of total consumption. In USA, for example, the share is 39% of total sweetener consumption. This article argues that the SSB tax alone may not be enough to have a positive impact on public health. Some strategies and challenges are discussed (in the context of a sweetener input tax) that could help health policy makers design an effective strategy for minimizing the use of excess sweeteners at the input level of the supply chain rather than implementing a tax at the output level, such as the SSB tax.

Compliance with Ethical Standards

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