

Perspectives

Why fat taxes won't make us thin

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ABSTRACT

Increasing prevalence of overweight and obesity has led policy-makers to consider health-related taxes to limit the consumption of unhealthy foods and beverages. Such taxes are currently already in place in countries in Europe (e.g. Hungary, France and Finland) and in various states in the USA. Although these taxes are possibly efficient in reducing by a small amount the consumption of targeted products if the tax is fully transmitted to the consumer, there is too little available evidence on what will be consumed instead and whether these food substitutions undermine the hoped-for health benefits of the tax. We also know very little on how the food supply side will respond and what overall impact this will have. Without a proper appreciation of the potential indirect impacts we do not know the overall impact of taxes on unhealthy foods and beverages and further that there is a very real possibility that they may not be beneficial for health after all.

Keywords economics, food and nutrition, obesity

Fighting the 'obesity' problem

Obesity and the implications of high bodyweight are among the greatest challenges facing health systems worldwide. Governments are, quite rightly, desperately seeking effective policy tools to turn the tide before it becomes a tsunami.^{1–3} The list of policy options follows the well-worn staples of public health: front of pack labels to improve consumer information on foods, restricting marketing of unhealthy foods, promoting healthy foods and the selection of healthy diets, and subsidizing healthy foods and activities. Unfortunately so far, at a population level, these policies have not been effective at scale: overweight and obesity rates and as well as nutrition-related chronic disease rates continue to increase in countries irrespective of income level. Data on 192 countries suggest that between 2005 and 2010 the average prevalence of overweight [body mass index (BMI) >25 kg/m²] increased from 45 to 48% and the prevalence of obesity (BMI >30 kg/m²) rose from 15 to 17%.⁴

A relatively recent policy option is a tax on unhealthy or high-energy content foods or beverages or on their constituent ingredients—the so-called 'health-related food tax'.⁵ The

logic is compelling—make these unhealthy foods more expensive and demand for them will fall. After all, we have increased the price of tobacco products for years, and fewer smokers remain willing to pay a high price to consume a deadly product. Usually, the subject of such a tax is a specific food or drink (e.g. sweetened beverages, salted snacks) or a food constituent, most commonly sugar, saturated fat or salt.

In what follows we will neither argue for nor against such taxes but aim to emphasize that there is a general lack of appreciation of the varied impacts that may result from health-related food taxes. We argue that without a proper appreciation of these potential impacts we cannot be sure what the effects of the taxes will be, and further that there is a possibility that they may be harmful to health.

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Health-related food taxes

Some of the most well-known 'health-related food taxes' have been introduced in Europe. A *Public Health Food Tax* on packaged products with high sugar, saturated fat or salt levels was introduced in September 2011 in Hungary and a tax on saturated fats was introduced in October 2011 in Denmark. 2011 also saw a re-introduction of a tax on sweets (including soft drinks and ice cream) in Finland and at the beginning of 2012, France introduced a tax on drinks with added sugar or sweetener. Debates on such taxes are also current in Ireland and in the UK. In the USA several states have applied small taxes on sugar-sweetened beverages. In November 2013, Mexico became the first country in Latin America to approve an excise tax on high-calorie packaged foods including potato chips, peanut butter and sweetened breakfast cereals and an increase in the tax on soft drinks.

To date, very few reports have emerged on whether these taxes have brought about any changes in consumption. A newspaper report from Finland describes the first year of the tax on sweets as a success that raised more revenue than expected while the consumption of sweets dropped.⁶ Based on this first-year success the Finnish government was reported to be considering widening legislation to create a 'sugar tax' to cover a wider range of products with added sugar.⁷ Similarly, preliminary figures from Denmark, Hungary and France reported a reduction in the consumption of foods and constituent ingredients targeted by these taxes.^{8–10} However, the most recent figures reported in the Finnish media indicate that the initial drop in the consumption of sweets did not persist and, according to retailers, sweet sales returned to previous levels¹¹ suggesting that the tax only had a short-term impact on demand.

Formal evaluations of these policies are needed to establish whether the impacts of these taxes are sustained in the medium- to long term. Crucially, the question remains whether any changes in consumption of the taxed foods (or indeed an increase in government revenues raised through the tax) will translate into changes in health outcomes for the population. The withdrawal in late 2012 of the Danish tax on saturated fat, only a year after its introduction, has also brought to wider attention the political struggles behind such taxes and their potential to trigger unintended consequences. For example, In the Danish case, the tax may have increased levels of cross-border purchasing of products high in saturated fat.^{12,13}

Predictable direct impacts of taxes

The 'law of demand' in economics says that there is an inverse relationship between price and demand, and therefore that higher prices should lead to less consumption and lower

prices to greater consumption. This does indeed apply to most products, including foods, but the responsiveness of the demand for foods to changes in prices is generally low (i.e. the demand is inelastic).¹⁴ Indeed a recent review suggests that taxes on foods would need to be at least 20% to have a meaningful impact on health outcomes.⁵ On average, in developed countries the responsiveness of consumption to changes in prices is relatively low because food comprises only a relatively small proportion of total household income (<20%)¹⁵ and so small changes in food prices do not really have any impact on consumption at a population level.

However, within countries, low-income populations are more sensitive to price changes because they spend relatively more on foods compared with their wealthier counterparts.¹⁴ Lower socio-economic groups also purchase a greater proportion of energy from less healthy foods and beverages in comparison with those in higher socio-economic groups, and we may therefore expect their consumption of these unhealthy foods to be reduced more by a tax.¹⁶ Disregarding the income inequality issue, this is potentially good news for health because lower income earners have a higher burden of risk factors for nutrition-related chronic disease¹⁷ and food taxes therefore have the potential to reduce health inequalities. But unfortunately, this is not the full story.

Although prices and incomes clearly play a substantial role, availability of substitute foods (eaten instead) and complementary foods (eaten together) as well as individual habits and preferences are critical factors that determine what food gets eaten. For example, heavy consumers of sugar-sweetened beverages have been found to be less responsive to price increases compared with light or moderate consumers.¹⁸ This means that a tax on such beverages may have a relatively bigger impact on those who were not really the problem in the first place. Although in absolute terms the change in the quantity consumed may be similar between heavy consumers and those who consume very little of taxed foods—and arguably the absolute change may be more relevant for health outcomes—the consumer welfare is lost due to taxes mostly for moderate, non-problematic consumers. Overall, there is a need for a much greater understanding of sensitivity to price changes across different segments of the population beyond obvious population characteristics.¹⁹ Who in a population actually responds to taxes by lowering their consumption of taxed products, and why?

On the positive side, even if the demand does not respond much to taxes, there will be an increase in government tax revenue that can be used to alleviate the regressive nature of the tax through re-distribution of the revenue within other programmes and policies. Also, if the tax is accompanied by a

strong public health message that is accepted by consumers, the benefits may multiply naturally.

Unpredictable indirect impacts of taxes: consumer side

More complexity, however, comes when we look beyond this direct effect of price on consumption. When the price of a particular food (e.g. red meat such as beef) increases then people will probably consume less of it (the *own-price effect*), but in doing so they are left with a decision about what to consume instead (the *cross-price effect*) (see Table 1). Part of the consumption is likely to be substituted with an alternative which ideally is healthier (e.g. white meat such as chicken), but it may very well be unhealthier (e.g. potato chips covered in salt) or just cheaper (e.g. lower quality beef). Also, consumers may still continue buying the now higher priced food but reduce the quantity of other foods they consume to continue to afford it, including healthy foods. This is known as the *income effect* and it is more likely to affect lower income earners as they spend a relatively greater share of their incomes on food.

It is clear that an understanding of these cross-price effects is critical for predicting the actual real-world impact of changes in food price on demand for food and the subsequent effects on population health. Yet, three recent large systematic reviews point out that most individual studies on the effectiveness of food and beverage taxes generally do not consider these effects^{5,20,21} which means that a lot of the current evidence base should be interpreted with this caveat in mind. Studies that address cross-price effects explicitly are emerging but these generally focus on either a narrow range of substitutes or on a very broad food group such as low-fat- versus high-fat content products, rather than across the whole diet.^{22–25}

Although cross-price effects tend to be small, they can be really important. For example, a recent US-based study examining the effect of substitution within 25 food groups from high-fat to low-fat and high-sugar to low-sugar products in

the context of a tax on fats or added sugars²³ found that if substitution is not considered, a tax on fats is more efficient than a tax on added sugars but if substitution is considered the opposite holds—a reversal in the primary finding. Similarly, when the effect of substitution between beverages is included, a 20% tax on sugar-sweetened beverages results in smaller reductions in body weight than in analyses in which substitutions are not considered.²⁵ Conversely, the substitution effects may actually reinforce the effect of the tax, if a wider range of substitution effects is considered. For example, a tax on sugar-sweetened beverages was found to reduce their consumption but also reduced the consumption of foods that were found to be complements, such as ice cream and salty snacks.²²

These substitution effects are not new and studies that do not include them generally identify this as a limitation to their findings. However, as a result of the methodological complexity involved in considering the whole demand system in simulation or modelling exercises and the heavy data demands, policy options are all too often being considered without full consideration of substitution effects (e.g. a recent modelling of a proposed 10% tax on sugar-sweetened tax in Ireland).²⁶

At the same time there is a risk of bias when using the cross-price elasticities. As the values are usually close to zero, even a small bias in estimation can cause a switch in the direction of the effect (either reduction or increase in the consumption of the alternative product). Because substitution patterns are *a priori* unknown, the bias becomes very difficult to detect. Also, due to multiple testing needs, traditional cut-off points for determining the statistical significance needs careful consideration.

A further step would be to examine the distortionary impact that food taxes may have on other expenditure, such as health care and education, or the economy more generally, with associated job losses and gains, impacts on inflation and balance of payments and so forth.²⁷ These are the likely issues that will be strongly emphasized by stakeholders who oppose health-related food taxes and they often find public support in negative economic climates.

Table 1 Own- and cross-price effects following a change in the price of beef

Own-price effect		Cross-price effects		
		Income	Substitution ^a	Complement ^b
Consumption of	Beef	Beef and other foods	Chicken	Potatoes:
Price of beef increases	Eat less beef	Eat less beef and other foods	Eat more chicken (now relatively cheaper)	Eat less potatoes
Price of beef decreases	Eat more beef	Eat more beef and other foods	Eat less chicken (now relatively more expensive)	Eat more potatoes

^aAssuming that chicken is a substitute for beef (eaten instead).
^bAssuming that potato is a complement for beef (eaten together).

Unpredictable indirect impacts of taxes—supply side

It is equally difficult to foresee the response to taxes from the supply side, i.e. how farmers, producers, processors and supermarkets will respond? To sustain sales the food industry may reduce the impact of the tax on consumers through lowering the profit margin of the products being taxed (also known as strategic pricing). A study on the French soda tax found that while the tax was fully passed on to the price of sodas (no untaxed substitutes), the tax was not fully passed on to the price of flavoured water and fruit drinks (substitutes more widely available).²⁸ Similarly, in Denmark, supermarkets did not fully pass on the tax to consumers on butter and oils, while discount stores fully transmitted the tax for blended spreads and oils.⁸ Interestingly, the discount stores also used the tax to increase their margins on butter and margarine, possibly because of the higher demand for these products from this type of store. Supermarkets are also able to spread the higher cost of taxed food onto other foods or own-branded products that typically have higher profit margins. These actions are all likely to reduce the hoped-for positive health impact of the food taxes as the price increase for the consumer can be manipulated to be much smaller than originally intended.

In addition to strategic pricing, food processors are likely to apply reformulation strategies that may change the quality (and possibly healthiness) of processed foods by using alternative, cheaper inputs or ingredients. In Mexico, the introduction of a tax on soft drinks reportedly led a major soft drink manufacturer to plan to reformulate its recipe to use cheaper high fructose corn syrup instead of cane sugar.²⁹ This reduces the price impact of the tax but makes the product potentially worse in terms of its health effect.³⁰ However, reformulation can also be positive for health, for example, the replacement of sugar with natural sweeteners resulting in soft drinks with 30% lower sugar content.³¹ Thus, taxes may have both positive and negative health effects through reformulation strategies, but of concern is that these effects are very difficult to predict in advance.

Tax is not a simple fix

We are not suggesting that health-related food and beverage taxes do not have a place in the list of possible policy options. What we are suggesting is that we need a much clearer understanding of whether the direct effects of a tax (less consumption of a taxed product) are reinforced, undermined or unaffected by indirect effects. A tax in the order of at least 20% of the price of a food product is far from being a simple

or predictable fix, albeit being one of the few upstream policy options that is straightforward to implement and send a clear health message.

Subsidising healthy foods has often been suggested alongside higher taxes for unhealthy foods. But we need to be careful here as well. Studies that look at the effectiveness of subsidies generally assume that people's reaction to falling prices is symmetrical to their reaction to increasing prices (i.e. taxes). Evidence from behavioural sciences; however, suggests that people's negative response to losses is far greater—often about twice as much—than their positive response to a gain.³² This means that own-price effects are likely to be larger for a price increase (tax) compared with an equivalent price decrease (subsidy).^{33,34} If this is true then subsidies will be even less effective at boosting the consumption of healthy foods than taxes are at decreasing unhealthy food consumption.

Furthermore, the cross-price effects will apply here too. If the price of one food drops due to subsidies (e.g. fruits) then consumers' disposable income increases and they could buy something else instead (e.g. meat). Depending on the other foods that consumers may now buy more of, the intended impact of subsidies could again be reinforced or undermined. A recent review of experimental studies found that food taxes resulted in a reduction in the amount of energy purchased, whereas subsidies resulted in an overall increase.¹⁹

Finally, there is the desperate need for consistent policies across sectors. For example, reforms in the sugar policy in the European Union have lowered the price of sugar in the EU consistently since 2006¹⁸ and a simulation study using French data showed that a 36% reduction in the price of sugar, associated with the EU sugar policy, would lead to an average decrease in the price of soft drinks by 3.4% (assuming the price decrease is fully transmitted to consumers).¹⁸ While the aim of the sugar policy is to make the agricultural sector more competitive, its consequence—to reduce the price of sugar for consumers—is contrary to recommendations of global nutrition and health policies. More joined-up policy-making is essential.

So, what else can we do to increase the healthiness of food choices?

Consumers make numerous decisions about food consumption on a daily basis, and price is only one determinant among other environmental, social and cultural factors influencing diets.³⁵ The fact that a ready-packed processed meal for a family appears a better choice than buying everything fresh and cooking from scratch is a driver behind consumption decisions that economics alone cannot explain. For that

reason we should also be looking to other disciplines for help—including behavioural economics and anthropology—so that we can gain a deeper insight into how consumers make their choices on what to buy, how much to buy and where they get their food within the increasingly complex food system.^{36,37}

We would suggest that government policy on food should not aim to change behaviour *per se*, but rather the environment that frames the context and cues that shape food behaviours and food choices; addressing the whole environment of food consumption from affordability to packaging, placement and display, lighting, size and shapes of plates, glasses and tables, and, yes, price also, but only as one component.

In formulating policy relating to making us thin, price needs to be seen as a contributing, but limited and blunt instrument; one that can complement other forms of intervention to change our relationship with food, environmental stimuli and health but not one that can achieve it alone.

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References

- 1 Foresight. Tackling obesities: future choices—Project Report. 2nd edn. London, UK: Government Office for Science, 2012.
- 2 U.S. Department of Health and Human Services. *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*. U.S. Department of Health and Human Services. Rockville, MD: Public Health Service, Office of the Surgeon General, 2001.
- 3 Department of Health. Healthy Lives, Healthy People: a call to action on obesity in England. 2011.
- 4 WHO. WHO Global Infobase. *NCD Indicators, International Comparisons*, 2013. <https://apps.who.int/infobase/Comparisons.aspx>. (10 October 2013, date last accessed).
- 5 Mytton O, Clarke D, Rayner M. Taxing unhealthy food and drinks to improve health. *BMJ* 2012;**344**:e2931.
- 6 Repo P. Revenues from tax on sweets exceeded all expectations. *Helsingin Sanomat* 2012.
- 7 Ministry of Finance. Sugar Tax Working Group emphasises influencing children's and young people's consumption. Press Release 11/2013. Finland, 2013. http://www.vm.fi/vm/en/03_press_releases_and_speeches/01_press_releases/20130131SugarT/name.jsp. Archived by WebCite® at <http://www.webcitation.org/6M0NTmMNn> (20 December 2013, date last accessed).
- 8 Jensen J, Smed S. The Danish tax on saturated fat—short run effects on consumption, substitution patterns and consumer prices of fats. *Food Policy* 2013;**42**:18–31.
- 9 WHO. Hungarian food tax changes consumption patterns. 2013. <http://www.euro.who.int/en/where-we-work/member-states/hungary/sections/news/2013/05/hungarian-food-tax-changes-consumption-patterns>. Archived by WebCite® at <http://www.webcitation.org/6M0NZpKIH> (20 December 2013, date last accessed).
- 10 Lentschner K. Le marché de soft-drinks a la gueule de bois (the soft drinks industry has a hangover). *Le Figaro* 26 July 2012.
- 11 Yle Uutiset. Sweet tax fails to slow candy consumption, 2013. http://yle.fi/uutiset/sweet_tax_fails_to_slow_candy_consumption/6992250. Archived by WebCite® at <http://www.webcitation.org/6M0NIEaYp> (20 December 2013, date last accessed).
- 12 Economist. Denmark's food taxes. A fat chance—the Danish government rescinds its unwieldy fat tax. *Economist* 17 November 2012.
- 13 Smed S, Robertson A. Are taxes on fatty foods having their desired effects on health? *BMJ* 2012;**345**:e6885.
- 14 Green R, Cornelsen L, Dangour A *et al.* The effect of rising food prices on food consumption: systematic review with meta-regression. *BMJ* 2013;**346**:f3703.
- 15 Gao G. World food demand. *Am J Agric Econ* 2012;**94**:25–51.
- 16 Pechey R, Jebb S, Kelly M *et al.* Socioeconomic differences in purchases of more vs. less healthy foods and beverages: analysis of over 25,000 British households in 2010. *Soc Sci Med* 2013;**92**: 22–6.
- 17 Robertson A, Brunner E, Sheiham A. Food is a political issue. In: Marmot M, Wilkinson R (eds). *Social Determinants of Health*. Oxford: Oxford University Press, 2006.
- 18 Bonnet C, Requillart V. Does the EU sugar policy reform increase added sugar consumption? an empirical evidence on the soft drink market. *Health Econ* 2011;**20**:1012–24.
- 19 Epstein L, Jankowiak N, Nederkoorn C *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.
- 20 Eyles H, Ni Mhurcu C, Nghiem N *et al.* Food pricing strategies, population diets and non-communicable disease: a systematic review of simulation studies. *PLOS Med* 2012;**9**:1–22.
- 21 Capacci S, Mazzocchi M, Shankar B *et al.* Policies to promote healthy eating in Europe: a structured review of policies and their effectiveness. *Nutr Rev* 2012;**70**:188–200.

- 22 Finkelstein E, Zhen C, Bilger M *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.
- 23 Miao Z, Beghin J, Jensen H. Accounting for product substitution in the analysis of food taxes targeting obesity. *Health Econ* 2012; doi:10.1002/hec.2885.
- 24 Schroeter C, Lusk J, Tyner W. Determining the impact of food price and income changes on body weight. *J Health Econ* 2008;**27**: 45–68.
- 25 Dharmasena S, Capps OJ. 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.
- 26 Institute of Public Health of Ireland. *Proposed Sugar Sweetened Drinks Tax*, Dublin, Ireland: Health Impact Assessment (HIA), 2012.
- 27 Smith R. Why a macroeconomic perspective is critical to the prevention of noncommunicable disease. *Science* 2012;**337**: 1501–3.
- 28 Berardi N, Sevestre P, Tepaut M *et al.* The impact of a 'soda tax' on prices. Banque de France 2012.
- 29 Flannery N. Mexico may make Coca-Cola give up cane sugar. 2013. <http://www.forbes.com/sites/nathanielparishflannery/2013/11/07/in-response-to-new-soda-tax-coca-cola-bottler-considers-switch-from-sugar-to-high-fructose-corn-syrup-in-mexico/> (10 January 2014, date last accessed).
- 30 Lustig R, Schmidt L, Brindis C. Public health: the toxic truth about sugar. *Nature* 2012;**482**:27–9.
- 31 Coca Cola. *Introducing Stevia Sweetener*, 2013. <http://www.coca-cola.co.uk/health/introducing-stevia-sweetener.html> (10 January 2014, date last accessed).
- 32 Tversky A, Kahneman D. Loss aversion in riskless choice: a reference-dependent model. *Q J Econ* 1991;**106**:1039–61.
- 33 Putler D. Incorporating reference price effects into a theory of consumer choice. *Mark Sci* 1992;**11**:287–309.
- 34 Epstein L, Dearing K, Paluch R *et al.* Price and maternal obesity influence purchasing of low- and high-energy-dense foods. *Am J Clin Nutr* 2007;**86**:914–22.
- 35 Dixon J, Isaacs B. Why sustainable and 'nutritionally correct' food is not on the agenda: Western Sydney, the moral arts of everyday life and public policy. *Food Policy* 2013;**43**:67–76.
- 36 Oliver A. Should behavioural economic policy be anti-regulatory. *Health Econ* 2013;**22**:373–5.
- 37 Just D. Behavioral economics and the food consumer. In: Lusk J, Roosen J, Shogren J (eds). *The Economics of Food Consumption and Policy*. NY: Oxford University Press, 2011,99–114.