

Cost-Effectiveness of a Tax on Sugar-Sweetened Beverages in Catalonia (Spain): A Modelling Study

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Introduction

Introduction

- A **tax on sugar-sweetened beverages** (SSB) was introduced in Catalonia on May 1st 2017. The tax rate varies depending on the sugar contained in the beverage
 - 5-8 grams of sugar per 100 ml: 0.08€ per litre
 - > 8 grams of sugar per 100 ml: 0.12€ per litre
- The aim of this tax is to **reduce the consumption** of these beverages given the negative effects of excessive sugar consumption on health in line with the recommendation issued by the World Health Organisation in 2016
- Catalonia (Official Health survey data 2017, ESCA)
 - 18-74 years: 35% overweight and 15% obesity
 - 6-12 years: 25% overweight and 11% obesity
- SSB consumption has a **direct relation** with overweight and obesity and it is linked to higher risks of some diseases (diabetes and cardiovascular)



Objective

- Estimate the Cost-effectiveness of the Catalan **tax on SSB**
- **Effectiveness:** population's Health
 - LYs: Life Years
 - DALYs: Disability Adjusted Life Years
- **Costs**
 - Design, implementation and tax surveillance costs for the public administration
 - Compliance and implementation tax for the tax-payers: SSBs distributors companies and bars, restaurants and cinemas
 - (public) Healthcare costs
- **Time horizon:** life time of adult Catalans
- **Perspective:** Societal
- **Discount rate:** 3% (costs and effectiveness)



Methodology and data

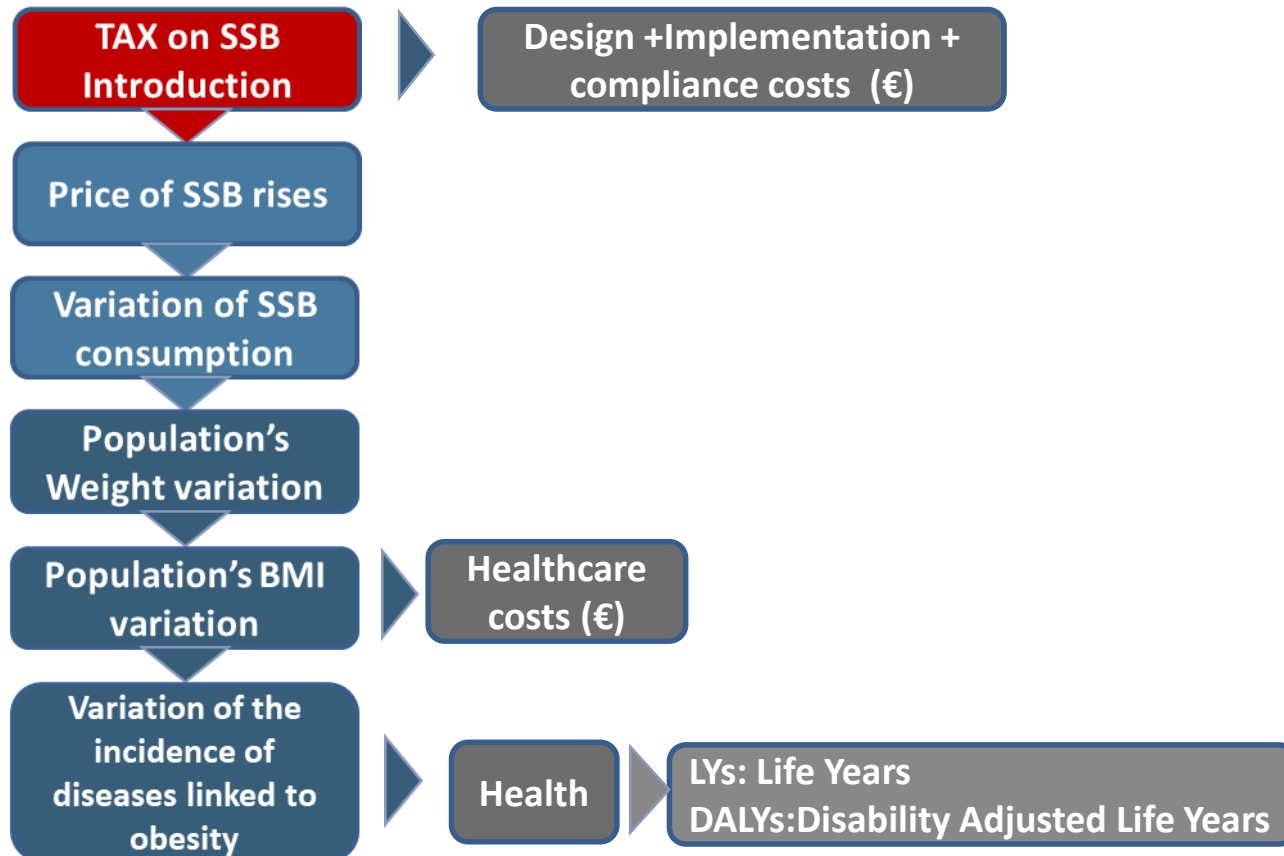
Methodology

- **Model:** adaptation to the catalan context of a model previously developed (Australian assessing Cost-Effectiveness obesity and ACE-Prevention)
- Markov cohort macrosimulation: proportional multistate life table model
- The model consists of a main life table populated with a closed cohort that replicates the 2017 Catalan adult (20+) resident population, aging it over time
- The population (cohorts by age and sex groups) transitions through four primary health states, based on annual transition probabilities, until death or age 95.
- The main life table incorporates all-cause mortality rates by sex and age.
- Running parallel to the main life table are life tables for each modelled obesity related disease



Methodology

- Model simultaneously simulates different trajectories for two identical populations: a counterfactual scenario of 'business as usual', and a scenario in which beverage consumption is changed because the tax



Data



Population consumption of SSB by sex & age groups before the tax :
Catalan Health survey 2016

+

2 independent studies of the impact of the Catalan SSB tax were identified (analysing data from two different supermarket chains)
(1) 15,4% consumption reduction
(2) 2,2% consumption reduction
Results will be presented using each one of these estimations

(1) Vall Castelló, J.; López-Casasnovas, G. (2018). «Impact of SSB taxes on consumption». CRESWP#201810-110.

(2) Mora, T.; Fichera, E. G.; Lopez-Valcarcel, B.; Roche, D. (2019). «Do consumers respond to “sin taxes” heterogeneously? New evidence from the tax on sugary drinks using longitudinal scanner data». Working paper.

Data



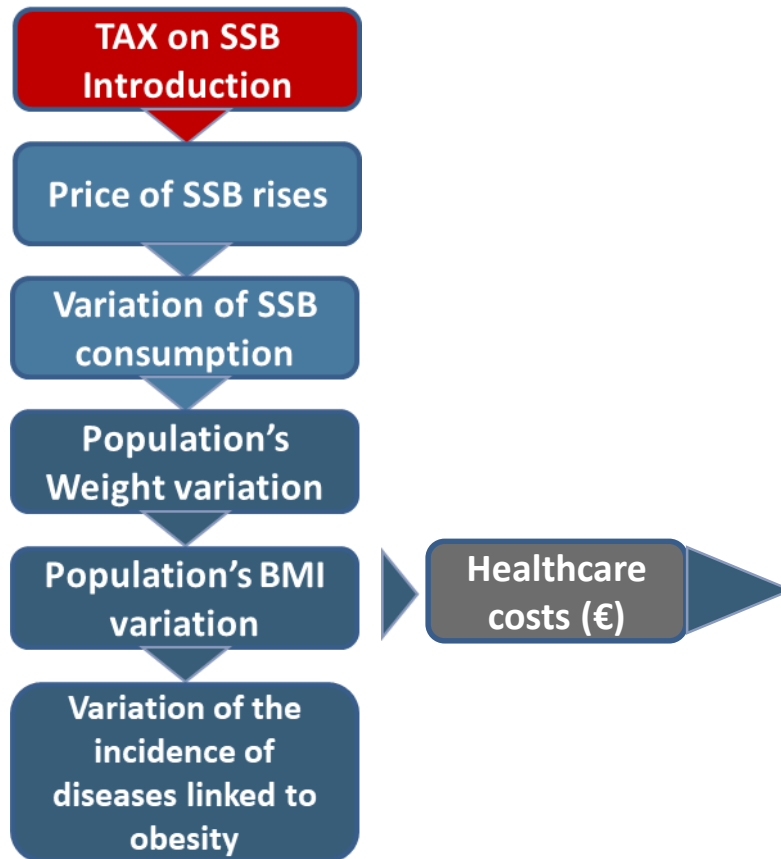
Population weight and height by sex & age groups:
Catalan Health survey 2016

+

Estimation of the weight reduction as a consequence of the SSB reduction:
nutritional evidence and information on sugar content of SSB



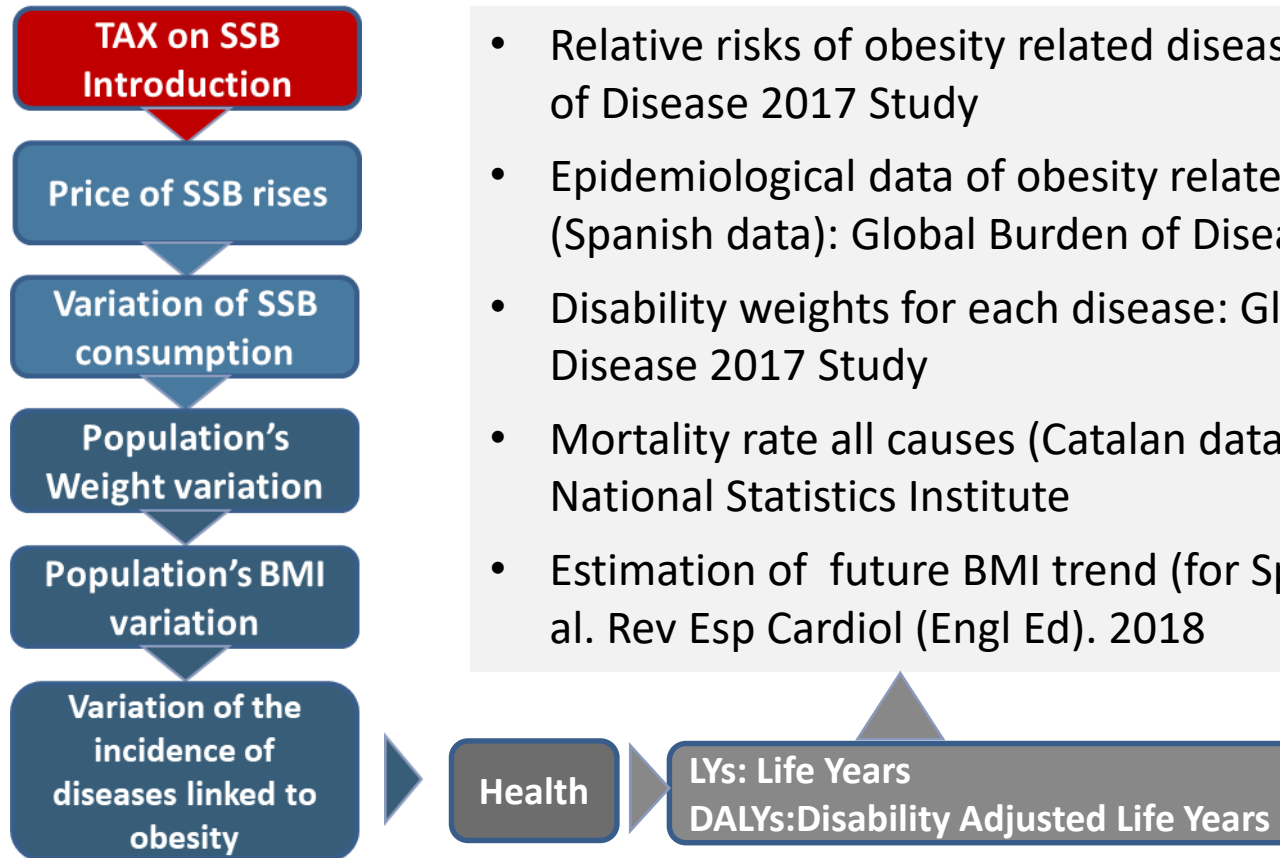
Data



Healthcare cost by age & sex & BMI groups:
Data from 2 recent studies that analyse Catalan data

- Mora, T.; Gil, J.; Sicras-Mainar, A. (2015). «The influence of obesity and overweight on medical costs: a panel data perspective». Eur J Health Econ. 2015 Mar;16(2):161-73.
- Vela, E.; Clèries, M.; Alberto Vella, V.; Adroher, C.; García-Altés, A. (2019). Population-based analysis of the Healthcare expenditure in Catalonia (Spain): what and who consumes more resources? Gaceta Sanitaria. 33 (1).

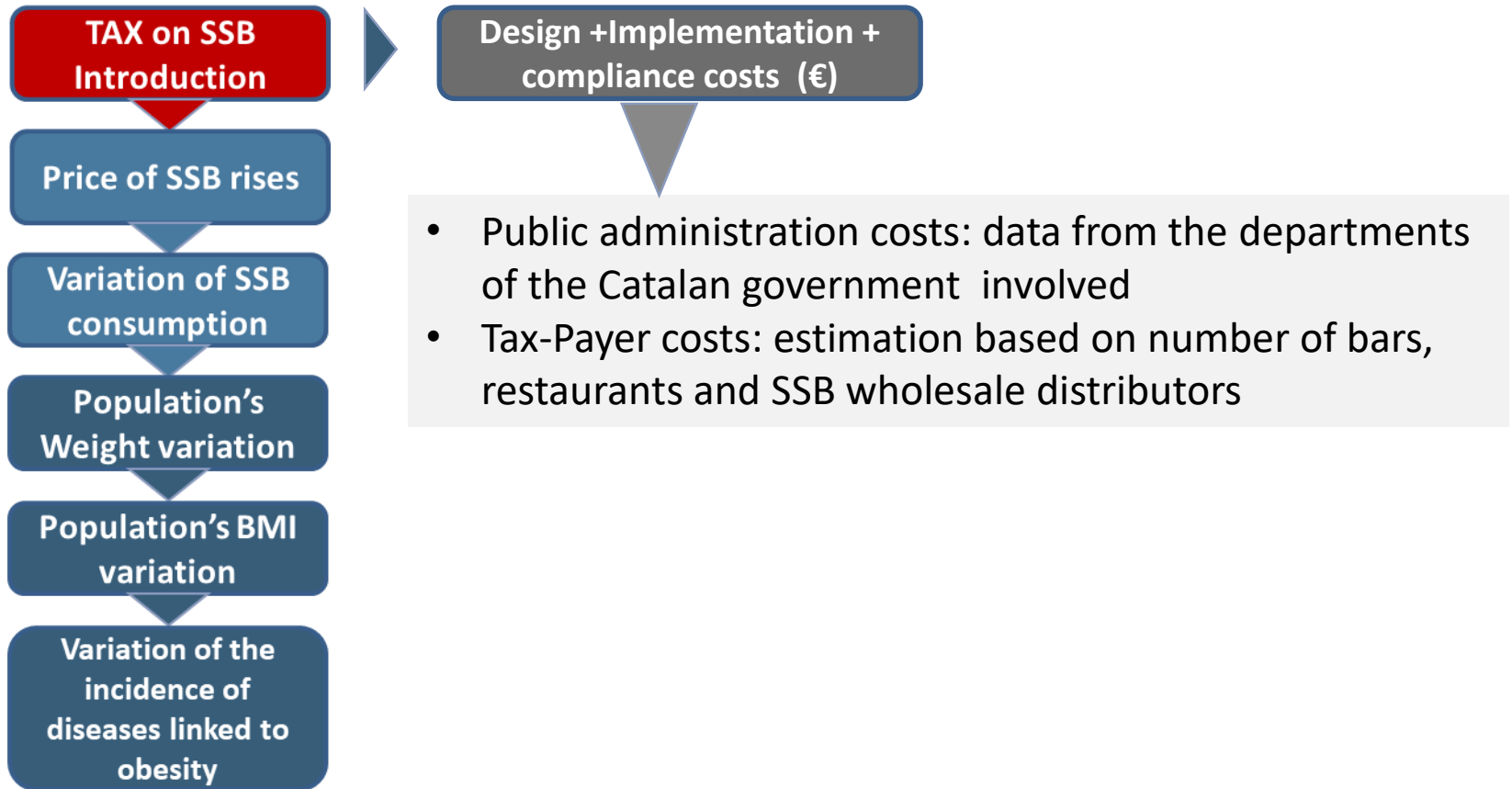
Data



- Relative risks of obesity related diseases ; Global Burden of Disease 2017 Study
- Epidemiological data of obesity related diseases (Spanish data): Global Burden of Disease 2017 Study
- Disability weights for each disease: Global Burden of Disease 2017 Study
- Mortality rate all causes (Catalan data) : Spanish National Statistics Institute
- Estimation of future BMI trend (for Spain): Hernáez et al. Rev Esp Cardiol (Engl Ed). 2018



Data



Results and limitations

Results

Design + Implementation + compliance costs (€)

Time Horizon	Design and implementation (€)	Compliance (€)	Total (€)
10 years	948.084	349.181	1.297.265
25 years	948.084	712.802	1.660.886
Life time (75 years)	948.084	1.211.375	2.159.459

Healthcare costs (€)

15,4% consumption reduction

Time Horizon	Healthcare Costs (savings) (millions of euros)		
	Total	Men	Women
10 years	-33,26 M€	-16,70 M€	-16,56 M€
25 years	-58,95 M€	-28,96 M€	-29,99 M€
Life time (75 years)	-63,32 M€	-28,08 M€	-35,24 M€

2,2% consumption reduction

Time Horizon	Healthcare Costs (savings) (millions of euros)		
	Total	Men	Women
10 years	-4,70 M€	-2,36 M€	-2,34 M€
25 years	-8,31 M€	-4,09 M€	-4,23 M€
Life time (75 years)	-9,01 M€	-4,05 M€	-4,96 M€



Results

LYs: Life Years

DALYs: Disability Adjusted Life Years

15,4% consumption reduction

Time Horizon	Life Years			DALYs		
	Total	Men	Women	Total	Men	Women
10 years	390	263	127	2.828	1.622	1.206
25 years	2.928	2.067	861	11.926	7.022	4.905
Life time (75 years)	9.390	6.366	3.023	24.928	14.594	10.334

2,2% consumption reduction

Time Horizon	Life Years			DALYs		
	Total	Men	Women	Total	Men	Women
10 years	55	37	18	398	228	170
25 years	412	291	121	1.680	989	691
Life time (75 years)	1.322	897	425	3.511	2.055	1.455



Results: cost-effectiveness

15,4% consumption reduction

Time Horizon	DALYs	LYs	Costs (M€)
10 years	2.828	390	-31,97
25 years	11.926	2.928	-57,29
Life time (75 years)	24.928	9.390	-61,16

2,2% consumption reduction

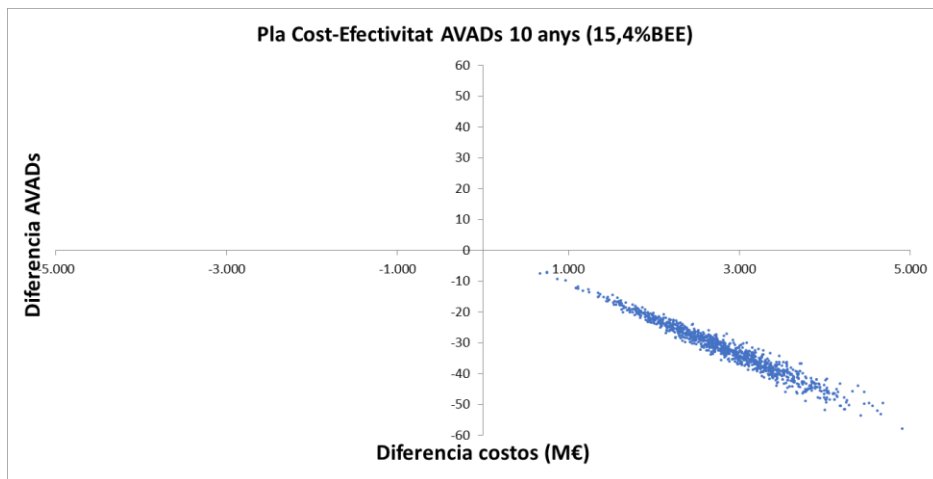
Time Horizon	DALYs	LYs	Costs (M€)
10 years	398	55	-3,40
25 years	1.680	412	-6,65
Life time (75 years)	3.511	1.322	-6,85



Results: sensitivity analysis

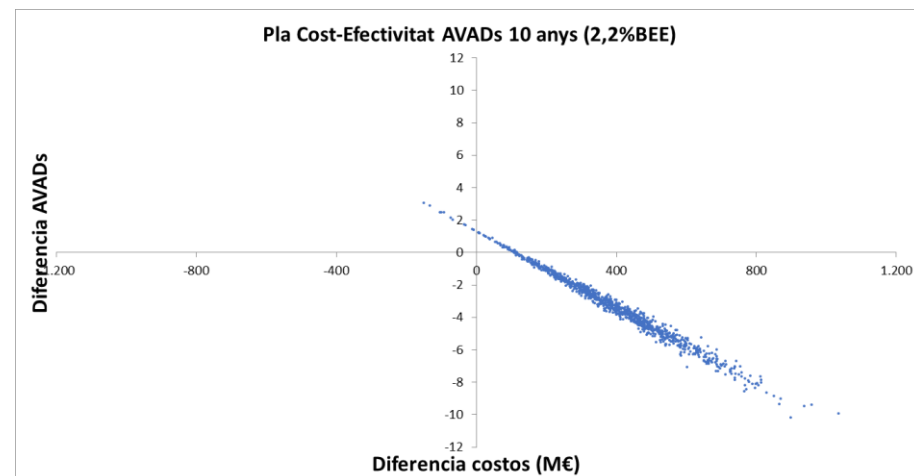
Monte Carlo simulation (1000 iterations) incorporating uncertainty in intervention effect on SSB consumption, relative risks of incident disease, BMI trend and healthcare costs by age, sex and BMI groups.

15,4% consumption reduction



SSB tax has a 100% probability of being efficient (better results and lower costs)

2,2% consumption reduction



SSB tax has a 95,1% probability of being efficient (better results and lower costs)



Limitations

- The model assumes that the reduction of SSB consumption as a consequence of the tax, and the associated weight reduction, is permanent and does not fade or change over time.
- The model assumes that the effect of reducing SSB consumption on the weight of individuals is immediate.
- The model assumes that past and current patterns of health services use and the effect of a condition (in this case, obesity) on the incidence of illnesses will be replicated in the future
- The impact of the tax on the population under 20 years has not been modeled.
- The direct impact of the reduction of SSB consumption (not mediated by variations in the BMI) on diseases such as diabetes or cardiovascular diseases is not modelled



Conclusions

Conclusions

- The SSB tax is an **effective public health** measure: improves life expectancy and increases health related quality of life of the population
- The SSB tax **reduces healthcare costs**
- Design, implementation and management costs of the tax are lower than the healthcare cost savings associated to the tax
- The Catalan SSB tax **is efficient in economic terms**: it implies an improvement in population health and savings for society, even considering a scenario with a lower reduction in the consumption of BEE.
- Therefore, based on the results of the evaluation, the recommendation is **to keep the tax**



Thank you!

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