HEALTH POLICY

POLICIES TO REDUCE TOBACCO HARM IN BULGARIA: LESSONS FROM SMOKE-FREE SWEDEN

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Abstract

Tobacco remains a leading cause of preventable deaths and disability-adjusted life years worldwide. Although the global prevalence of tobacco consumption declines, there are marked differences between EU countries. The percentage of daily smokers in the EU ranged from 6.4% in Sweden to 28.7% in Bulgaria in 2019. Various metrics on smoking habits indicate record high tobacco use in Bulgaria. Unlike this country's limited success in tobacco harm-reduction public policies, Sweden has implemented well-targeted taxation to differentiate tobacco products by their riskiness, favouring conversion to smokeless tobacco. Bulgaria could draw on the Swedish experience. Whereas policies to reduce smoking in Sweden have been based on the consumption of snus as the most favoured non-combustible tobacco alternative, Bulgaria could support other smoke-free tobacco substitutes gaining popularity in the country. To quantify the potential health gains in Bulgaria assuming a replication of the rates of conversion to smokeless tobacco in Sweden, this study develops an original model where several scenarios are simulated. The results are impressive: Bulgaria could have saved nearly 8 000 lives and reduced up to 222 050 disability-adjusted life years in 2021 if managing to emulate the successful policies of Sweden.

Keywords: *Bulgaria, Sweden, tobacco, smoking, snus.*

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Tobacco smoking has strong negative effects on health. Recent estimates from the World Health Organization (WHO, 2023a) indicate that tobacco is responsible for over 8 million deaths globally each year, with approximately 7.7 million of these deaths resulting specifically from smoking. Around 1.3 million non-smokers die due to being exposed to second-hand smoke. The heavy health burden from tobacco is evidenced further by disability-adjusted life years (DALYs) lost. The Institute for Health Metrics and Evaluation (IHME, 2021) calculates the number of DALYs linked to tobacco use at around 200 million, or nearly 7% of all DALYs lost worldwide.

Overall tobacco consumption remains a leading cause of preventable deaths and DALYs worldwide, underscoring the urgent need for effective policy interventions to reduce its prevalence and impact. Such policies should be appropriately designed and implemented in a way that takes into account the wide variation in smoking patterns across countries.

TOBACCO SMOKING TRENDS

The global prevalence of tobacco consumption is trending downwards. The proportion of adults aged 15 and above who use tobacco has decreased from 32.7% in 2000 to 20.9% in 2022, with projections suggesting it will fall to 18.1% by 2030. Similarly, in the World Health Organization's *European Region*[3] the prevalence has declined from 34.4% in 2000 to 25.3% in 2022, and is expected to reach 23.1% by 2030.

The global number of tobacco users has dropped from 1.362 billion in 2000 to 1.245 billion in 2022, with a projected decline to 1.197 billion by 2030. In the *European Region* there were 229 million tobacco users in 2020 and 179 million in 2022, and by 2030 that number is projected to go down to 164 million (WHO, 2024).

This trend is mirrored in the European Union (EU) overall. In 2019 the share of daily smokers aged 15 and older was reported at 18.4% (Eurostat, 2022). This represents a decrease from 19.0% in 2014, according to European health interview surveys. EU smokers who consumed twenty or more cigarettes a day were 5.9%, down from 6.1 five years earlier.

Notably, however, there are considerable differences between EU members. The percentage of daily smokers in the EU ranged from 6.4% in Sweden to 28.7% in Bulgaria in 2019. In 2014 that same share stood at 8.7% in Sweden and 27.3% in Bulgaria: implying that smoking prevalence even increased in Bulgaria, albeit slightly.

Zooming in further on these two polar EU cases, besides prevalence also the smoking intensity varies substantially and indeed it even diverges. According to latest available data from Eurostat the share of heavy tobacco users in Sweden smoking twenty or more cigarettes daily has gone down from 1.2% in 2014 to 1.0% in 2019. The similar share in Bulgaria has increased from 12.7% in 2014 to 12.9% in 2019. That tendency poses concerns with regard to how apt tobacco harm reduction strategies in this country are.

Further metrics on smoking behaviour corroborate the worrisome evidence about Bulgaria. The latest specialised Eurobarometer survey shows that the average proportion of EU citizens

[3] WHO defines six global regions: African Region, Region of the Americas, South-East Asia Region, European Region, Eastern Mediterranean Region and Western Pacific Region. The European Region includes 53 countries: https://iris.who.int/handle/10665/350404

using traditional tobacco products such as cigarettes, cigars, cigarillos or pipes is 24% (Eurobarometer, 2024). Once again Bulgaria reports the highest smoking prevalence (37%), while Sweden has the lowest (8%).

A summary of smoking prevalence by sub-groups of the population is provided in the following table:

Table 1. Population currently smoking

Population currently smoking (%)	EU27	Bulgaria	Sweden
Total	24	37	8
Gender			
male	28	49	9
female	21	27	8
Age			
15-24	22	23	3
25-39	32	52	9
40-54	28	53	8
55+	19	24	10

Source: Eurobarometer (2024)

The table illustrates that in Bulgaria the bulk of smoking prevalence falls upon the middle-aged, broadly in line with the EU-average distribution, whereas in Sweden smoking is markedly less popular among the youngest.

Tobacco smoking has long captured policymakers' attention because of its detrimental effects on health. The latest country health profile of Bulgaria published by the European Commission singles out the "particularly high smoking rates" in the country as a prime contributing factor to preventable mortality. Unlike the overall EU-wide trend, mortality from treatable causes in Bulgaria has increased of late to a rate now double the EU average. Tobacco contributed to around 18% of deaths in Bulgaria, which exceeds the EU average of 17%. (European Commission, 2023).

The information above provides the rationale for a comparative study on tobacco consumption, smoking reduction policies and the corresponding health effects in Bulgaria compared to Sweden. While Sweden provides unique results from dedicated public policies to reduce smoking, Bulgaria has more limited success in its public health and taxation policies, as will be discussed below. Therefore a special focus on the two extreme EU examples may distil best practices that could plausibly be pursued elsewhere, indicating valuable policy insights for the entire EU. This motivates the present analysis.

This study is structured as follows. First, the impact of tobacco smoking on health is outlined by looking at the burden of diseases particularly affected by it. As these health profiles are conditional upon country circumstances, the main features of tobacco use and the public policies in Bulgaria versus Sweden are discussed. Then a method is put forward to estimate how health outcomes in Bulgaria could be improved if it were to follow policies inspired by

the Swedish experience. Tangible health gains from tobacco harm reduction alternatives are duly calculated. A final section sums up the findings and concludes.

VALUABLE INSIGHTS FROM SWEDEN

A major contribution of this analysis is the detailed comparison between Sweden and Bulgaria concerning tobacco consumption prevalence and the effects of smoking on health. While examining the diverging patterns in tobacco use in the two countries, the different public policy approaches in this area, namely the national taxation structures, are highlighted. This provides important understanding of the successful transition of Sweden to becoming the first "smoke-free" country in Europe as a result of not just consumer habits and behavioural specifics but also well-designed targeted policies.

The experience of Sweden is both valuable and unique. Therefore a highlight of this research is the comprehensive presentation of that country's tobacco-related consumption practices. In a distinct contrast to other European countries, Swedish tobacco users display a widespread preference for smokless tobacco products, particularly snus. The specific predisposition of consumers in Sweden, grounded in historical trends, has been integrated into the national public health policies which have effectively promoted the appeal of such smokeless products. By illustrating how Sweden's public health initiatives have assisted the less harmful consumer choices, the study emphasizes the need to explore the potential benefits of adopting similar strategies in Bulgaria.

Motivated by these insights, an original model is put forward below to simulate the hypothetical replication of Sweden's tobacco control policies and consumption trends within the Bulgarian context. This model represents another contribution of this study. It is applicable despite preferences for different non-combustible alternatives in the two countries, demonstrating that Bulgaria could achieve substantial reduction in smoking by focusing on the smoke-free tobacco products currently gaining popularity in the country. The model yields the first quantitative assessments of potential health benefits in Bulgaria from adopting evidence-based harm-reduction policies similar to those of Sweden. The resulting health gains in Bulgaria would be considerable, providing the country's policymakers with a compelling argument to pursue policies discouraging users away from heavy smoking to less harmful tobacco alternatives.

EFFECTS OF SMOKING ON HEALTH

The severe health impact of smoking becomes evident when assessing the role of smoking as the risk factor for certain diseases. Evaluating the effects of smoking on health should explore its causal association with increased probability of a disease incidence. Then the burden of the disease has to be expressed through relevant indicators.

To that end, certainly deaths measure the ultimate health burden. Besides deaths, however, the human health status encompasses a range of health conditions and degrees of malfunctioning.

Since the seminal work by Murray and Lopez (1996), disability adjusted life years (DALYs) have been adopted as a standard synthetic metric for the broad health consequences from a disease. DALYs are calculated as the sum of two components: years of life lost (YLL) and

years lived with disability (YLD) because of a certain disease or health condition. Thus DALYs combine information on both mortality and morbidity into a single measure[4].
Both deaths and DALYs are therefore employed as health burden indicators here.
Going further, the present analysis is centred on several non-communicable diseases (NCDs). They are the predominant cause for both deaths and DALYs across the world.
The Institute for Health Metrics and Evaluation estimates that NCDs led to around 64.5% of all deaths and 59.9% of the DALYs globally in 2021. NCDs are an even higher contributor to mortality and DALYs in both Bulgaria and Sweden, as the table below demonstrates.

Table 2. Deaths

	Bulgaria	**Sweden**	**Globally**
Deaths attributed to NCDs (%)	68.2	85.4	64.5
DALYs attributed to NCDs (%)	69.1	84.9	59.9

Source: Institute for Health Metrics and Evaluation (2021) database.

Among the main mortality-causing NCDs, the ones most strongly associated with tobacco smoking as a risk factor are: lung cancer[5], chronic obstructive pulmonary disease, ischemic heart disease, and stroke. In 2021 this disease group accounted for 32.4% of global deaths according to the Institute for Health Metrics and Evaluation data. In Bulgaria 37.6% of total deaths, well above the global average, were caused by these diseases, whereas the share in Sweden stood at 31.0%, slightly below the global average[6].
Results extracted from the Global Burden of Disease (GBD) database reveal a telling picture of the riskiness attributed to tobacco smoking across the various diseases and countries.
First, tobacco smoking turns out to be a leading risk factor for deaths, based on the detailed data collected in the GBD latest study:

- In Bulgaria 65.2% of all deaths caused by tracheal, bronchus and lung cancer can be attributed to smoking, while in Sweden this share is 58.0% (the global average is 59.3%).

[4] Discussions on detailed technical calculations of DALYs worth noting include Conte Grand (2014) and Devleesschauwer et al. (2014). Steenland and Armstrong (2006), Rehm and Frick (2010) and Solberg, Norheim and Barra (2017) present critiques of the methods used for measuring the health burden of diseases. Recently Beresniak et al. (2024) analyse limitations of DALYs in particular, calling for a reassessment of their application.
[5] This study uses 'lung cancer' in short for 'tracheal, bronchus and lung cancer' (the latter being the precisely denoted category in The Global Burden of Disease database of the Institute for Health Metrics and Evaluation, 2021).
[6] Lung cancer is reported to be the second most common cancer, ranked as the world's top cause of cancer-related mortality in 2020 (Zhou et al., 2022). The World Health Organisation defines chronic obstructive pulmonary disease (COPD) as a "common lung disease causing restricted airflow and breathing problems ... [and it is] sometimes called emphysema or chronic bronchitis" (WHO, 2023b). Ischemic heart disease (IHD) refers to "heart problems caused by narrowed heart (coronary) arteries that supply blood to the heart muscle" and can cause a heart attack (Institute of Medicine, 2010). According to the American Stroke Association, a stroke occurs "when a blood vessel that carries oxygen and nutrients to the brain is either blocked by a clot or bursts (or ruptures)" (source: https://www.stroke.org/en/about-stroke).

- 33.2% of all deaths from COPD in Bulgaria and 34.5% in Sweden are caused by smoking (the global average is 35.9%).
- 12.4% of all deaths caused by IHD can be attributed to smoking in Bulgaria and 12.7% in Sweden (the global average is 15.0%).
- In Bulgaria 7.3% of all deaths caused by strokes can be attributed to smoking, while in Sweden strokes attributed to smoking account for 7.5% of all deaths (the global average is 11.4%).

Secondly, the high risk factor attribution from tobacco smoking is also seen when measured in terms of DALYs, based on the GBD data:

- In Bulgaria 69.6% of all DALYs caused by tracheal, bronchus and lung cancer stem from smoking, while in Sweden this share is 60.6% (the global average is 59.5%).
- Smoking contributes to 39.2% of the DALYs caused by COPD in Bulgaria and 37.3% in Sweden (the global average is 34.8%).
- 19.5% of all DALYs caused by IHD in Bulgaria and 16.5% in Sweden are linked to smoking as the risk factor (the global average is 18.8%).
- In Bulgaria 11.9% and in Sweden 10.2% of all DALYs caused by strokes are attributable to smoking as the risk factor (the global average is 14.0%).

The above results indicate that by most measures the health burden attributable to smoking is heavier in Bulgaria compared to Sweden. While in both countries the deaths burden is usually below the corresponding world averages, in terms of DALYs from lung cancer and COPD they perform relatively worse.

Delving into population structures reveals that the health risks associated with tobacco smoking vary across ages. The following aggregate age-group statistics shed further light on the distribution of the health burden, suggesting where potential anti-smoking policies may be prioritized.

Table 3. Deaths attributed to tobacco smoking as risk factor (%)

		Bulgaria	Sweden	globally
All ages	Lung cancer	65.2	58.0	59.3
	COPD	33.2	34.5	35.9
	IHD	12.4	12.7	15.0
	Stroke	7.3	7.5	11.4
15-49 years	Lung cancer	71.8	48.0	43.5
	COPD	54.9	29.8	24.7
	IHD	51.1	33.0	27.9
	Stroke	41.7	22.6	22.1
50-74 years	Lung cancer	73.0	66.5	63.5
	COPD	52.2	46.0	38.9
	IHD	25.0	25.5	20.6
	Stroke	17.0	16.7	15.8

Source: Institute for Health Metrics and Evaluation (2021) database

Table 4. DALYs attributed to tobacco smoking as risk factor (%)

		Bulgaria	Sweden	globally
All ages	Lung cancer	69.6	60.6	59.5
	COPD	39.2	37.3	34.8
	IHD	19.5	16.5	18.8
	Stroke	11.9	10.2	14.0
15-49 years	Lung cancer	70.8	46.7	42.0
	COPD	50.0	26.0	19.8
	IHD	50.4	32.6	27.0
	Stroke	40.2	20.6	20.6
50-74 years	Lung cancer	74.2	66.6	63.3
	COPD	51.9	46.1	37.6
	IHD	27.7	26.4	21.7
	Stroke	18.7	17.6	16.5

Source: Institute for Health Metrics and Evaluation (2021) database

These results are intriguing. As a general observation, the health burden from tobacco smoking is evidently heavier in Bulgaria than Sweden. Studying the results by age groups, both mortality and DALYs in Bulgaria turn out strikingly higher for people under 50 especially. The elderly cohorts in Bulgaria also fare worse than their Swedish counterparts but by smaller margins per disease.

In Bulgaria lung cancer and COPD associated with tobacco smoking affect all ages almost evenly. Those under 50 suffer relatively more from IHD and stroke, whereas the surviving cohorts of smokers seem to face lower probabilities of deaths or DALYs from these diseases attributed to tobacco.

In Sweden the risk distribution is somewhat different. Younger people, compared to those aged 50 and more, bear relatively lower burden from lung cancer and COPD caused by tobacco smoking. That is in sharp contrast to Bulgaria. Regarding IHD and stroke, however, elderly Swedes are affected relatively less often, much like the situation in Bulgaria.

Thus the empirical evidence exposes noticeable differences between Bulgaria and Sweden with respect to smoking prevalence and the ensuing health impact. The next section discusses behavioural specifics and policies than lie behind the outstanding Swedish progress in almost eradicating tobacco smoking.

HEAVY-SMOKE BULGARIA, SMOKE-FREE SWEDEN

Tobacco markets in Bulgaria and Sweden operate under the EU rules imposing specific excise taxes on cigarettes and other tobacco products. The EU Tobacco Tax Directive[7] defines the following categories of manufactured tobacco products: cigarettes and ‘manufactured tobacco

[7] Council Directive 2011/64/EU of 21 June 2011 on the structure and rates of excise duty applied to manufactured tobacco.

other than cigarettes' (cigars and cigarillos, fine-cut tobacco intended for the rolling of cigarettes, and other smoking tobaccos).

The Directive levies a minimum floor for excise taxes on these products. On cigarettes in particular, EU member states are required to levy a specific *ad quantum* component (a fixed amount per pack) and an *ad valorem* excise tax (an additional percentage of the retail sales price). The *ad quantum* component is between 7.5% and 76.5% of the total tax burden, expressed as a fixed amount per 1000 cigarettes.

The existing minimum cigarette excise rates in the EU are €1.80 per a 20-cigarette pack, and the minimum total excise duty is at least 60% of the national weighted average retail price. These minimums have remained unchanged since 2014. Member States that apply excise duties of €115 or more per 1000 cigarettes (that is €2.30 per pack) do not need to comply with the aforementioned 60% criterion.

In February 2020 the European Commission published an evaluation of Directive 2011/64/EU[8]. The EU had also commissioned an external study on Directive 2011/64/EU, published in January 2019[9]. However, the process of updating the EU rules has been paused.

Given this legal context, each country in the EU imposes levies on cigarettes at different levels above the minimums required under the Tobacco Tax Directive. Notably (and despite its highest smoking prevalence) the excise tax on cigarettes in Bulgaria is the lowest in the EU (€1.92 per pack). The weighted average retail selling price (including excise and VAT) in Bulgaria is also the lowest in the EU (€2.89 per pack).

Sweden has employed a very different approach. Its minimum excise tax on a pack of 20 cigarettes is one of the EU highest (€3.23 per pack). The average retail selling price (including excise and VAT) in Sweden is also among the highest (€5.52 per pack)[10].

An immediate hypothesis would be that the levels of taxation are the factor explaining the widely divergent smoking prevalence in Bulgaria and Sweden. Closer scrutiny, however, calls for more complicated reasoning.

The comparison in data reveals that tax (including excise and VAT) in Bulgaria as a share of the final selling price amounts to 83.3%, which is among the highest in the EU and higher than Sweden's 78.6%. As a matter of fact it is even above the average share in the EU (81.9%).

Also Bulgaria currently has the lowest level of GDP per capita in the EU according to Eurostat (2024). This implies that the purchasing power of Bulgarian consumers is already rather constrained. Therefore it is not just that the current tax levels have been unable to induce lower prevalence of smoking in Bulgaria: further increases in tax levels *per se* on cigarettes might have muted effect on Bulgarian consumers' preferences.

As a general approach, taxation certainly is the major public policy tool used to shape smoked tobacco use. From early literature reviews such as Chaloupka (1999), there is ever-growing empirical evidence that taxes do influence the dynamics and patterns of consumer behaviour.

[8] The Commission staff working document is available at: https://taxation-customs.ec.europa.eu/system/files/2020-02/10-02-2020-tobacco-taxation-report.pdf

[9] That report was produced by Economisti Associati; it is available at: https://taxation-customs.ec.europa.eu/system/files/2020-02/study-on-the-tobacco-taxation-directive-2019_en.pdf

[10] Data cited here is from Tax Foundation (2024).

Tobacco taxation has been embraced worldwide as the favoured and efficient mechanism at the centre of public health policies aimed at motivating consumers away from traditional tobacco products to less harmful alternatives. The World Health Organization (2023b) documented and analyzed cigarette excise taxes in 180 countries across the globe.

The key to successful policies in this field, however, lies in optimizing the *structure* of national tax policies rather than focusing merely on the tax *levels*. Price-targeting measures through tax hikes, let alone direct prohibitions, may not necessarily deter smokers in reality. Instead, policies which take into account the existence of less harmful tobacco products and hence comprise better-designed risk reduction strategies, have true potential to encourage transitioning away from tobacco smoking.

The approaches in Bulgaria and Sweden exemplify exactly the importance of the optimal structures of taxation: namely, the excise treatment of traditional tobacco products such as cigarettes versus alternative non-combustible tobacco products.

Boxed cigarettes are by far the most popular product among tobacco smokers in the EU. They are regularly (i.e. at least monthly) consumed by 77% of smokers of traditional tobacco products. The share of traditional smokers who regularly consume boxed cigarettes is as high as 96% in Bulgaria and 86% in Sweden (Eurobarometer, 2024).

Heated tobacco products (HTPs) and e-cigarettes are gaining popularity among EU consumers as alternative tobacco products. HTPs are currently consumed by 2% of EU citizens, 2% of Bulgarians and 1% of Swedes. E-cigarettes are currently consumed by 3% of EU citizens, 3% of Bulgarians and 1% of Swedes. These shares exclude those who report having used or tried such products in the past (Eurobarometer, 2024).

Bulgaria until recently did not levy any excise on HTPs and e-cigarettes. Following amendments to the *Law on Excises and Tax Warehouses*, HTPs became subject to excise since 1 January 2018 and e-cigarettes since 1 March 2023.

Sweden introduced taxing e-cigarettes from 2018[11]. HTPs in Sweden are not defined separately for tax purposes but are taxed under the category of "smoking tobacco"[12].

An overview of comparable tax parameters in the two countries is provided in the following table. It first refers to the so-called lowest excise duties (LED): a metric incorporating the effects of the complexities of national tax systems into "an easily computable function of its key parameters"[13]. LED is the excise rate on a product when producers, distributors and retailers generate zero revenue; it thus provides a measure of the excise floor nationally.

LED values for cigarettes and HTPs can be compared directly following a conditional transformation of HTP sticks into cigarette numbers on the basis of respective tobacco equivalence[14]. The table also contains tax policy parameters for e-cigarettes. Excise duty rates there are calculated in terms of liquid volumes characterised by their nicotine rather than

[11] Source: Library of Congress. Retrieved from https://www.loc.gov/item/global-legal-monitor/2018-07-26/sweden-new-tax-on-electronic-cigarettes-and-other-non-tobacco-nicotine-products-takes-effect/

[12] Source: https://www.tobaccofreekids.org/what-we-do/global/taxation-price/tax-gap-sweden

[13] López-Nicolás (2023, p. 13). Value-added taxes, although affecting LEDs, are not included in this table since they are not specific to the tobacco products.

[14] López-Nicolás (2024, p. 17).

tobacco content. The latter hinders straightforward comparisons directly to traditional cigarettes or HTPs.

Table 5. Tax policy parameters

	Bulgaria	**Sweden**
LED on cigarettes (€ per 1000 sticks)	101.95	165.67
LED on HTPs (€ per 1000 sticks)	43.22	55.23
LED on HTPs (fraction of LED for cigarettes)	0.42	0.33
liquids for e-cigarettes (nicotine containing, € per millilitre)	0.18	0.18-0.35*

* The higher value is applied to highly concentrated e-liquids (defined as containing nicotine between 15 and 20 mg per millilitre).

Source: Based on data from López-Nicolás (2023, 2024) and own calculations. 2023 data except for liquids for e-cigarettes where the rates effective from 1 January 2024 were searched in national sources and converted into euro[15].

As seen from row 3 in the table above, Sweden is more geared towards promoting the smokeless and less-harmful HTP alternative. As for e-cigarettes, there is no difference with respect to e-liquids with normal concentration.

Thus the design of taxation through well-differentiated rates contributes to Sweden's recent success of becoming Europe's first smoke-free country, along with other policy measures such as strict public smoking bans, education and public health measures[16].

This becomes even clearer upon a closer examination of national specifics. Sweden's progress is due to its policies, including taxation, with respect to one tobacco product which is almost singularly Swedish: the *snus*.

Indeed tobacco users in Sweden are distinct with their particular preference for this alternative to both traditional smoked tobacco and products such as HTPs and e-cigarettes. International research and statistics sometimes treat *snus* within the product category of nicotine *pouches* but the *snus* should rather be viewed as a smoke-free tobacco product special to the Swedish market.

[15] BGN/EUR at the fixed rate of 1.95583; SEK/EUR at the average 2024 exchange rate based on the official European Central Bank SEK/EUR rates extracted from https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/eurofxref-graph-sek.en.html

[16] A comprehensive list of national tobacco prevention measures in Sweden is provided by the Public Health Agency of Sweden here: https://www.folkhalsomyndigheten.se/the-public-health-agency-of-sweden/living-conditions-and-lifestyle/andtg/tobacco/towards-a-smoke-free-sweden/

BOX 1. SNUS IN SWEDEN

The popularity of *snus* in Sweden nowadays is preceded by a long history of tobacco in Europe. Initially used for medical purposes as early as the 16th century, tobacco consumption gained popularity in France in the 18th century in the form of snuff (powdered tobacco leaves inhaled through the nose). After the French Revolution, in Sweden snuffing tobacco gave way to pinching it under the lips. Swedish farmers started growing their own tobacco and producing their own *snus*. A *snus* factory was set up in Goteborg in 1795 and in the 19th century *snus* consumption became widespread in Sweden.

After some decline in *snus* use in Sweden after World War II, when cigarettes became more popular under the influence of American trends, *snus* experienced a resurgence in the 1960s and 1970s along with the rising awareness of risks from smoking and the introduction of more accessible portioned *snus*.

The *snus* (moisted *snus*) consumed today in Sweden is a smokeless tobacco product delivering lower concentrations of harmful chemicals than other tobacco products while retaining high nicotine content (Furberg et al., 2006).

Snus is similar in appearance to nicotine pouches and both are used orally. While *snus* is made from tobacco and contains fine tobacco powder, nicotine pouches do not contain tobacco leaves but usually contain nicotine extracted from tobacco.

There is also a distinction between Swedish and American *snus*. Swedish *snus* typically comes in two forms: loose tobacco or pouches, and is known for its robust tobacco flavor. In contrast, the American equivalent has milder tobacco taste and is often sweeter.

Snus pouches are recommended to be stored in the fridge or cool, dry places.

Sources:

https://snusforumet.se/en/the-history-of-snus/

https://www.swedishmatch.com/Our-business/smokefree/History-of-snuff/

https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=a54739fcf099f343c8586bc5c4af029077bc342e

https://www.snusochtandsticksmuseum.se/en/explore/snus/snus-history/

https://www.pmi.com/our-science/snus-snuff-nicotine-pouches-explained#snusnic

In this context Eurobarometer (2024) reports that 4% of Europeans use or have used nicotine *pouches*. In Bulgaria this share is also 4%, while in Sweden it rises to 20% (the consumption of *snus* inferred here). Furthermore, 9% of Swedes respond they are using this special tobacco alternative regularly (i.e. at least monthly)[17].

As for the tax treatment, *snus* in Sweden was levied an excise rate of SEK 526 per kilogram (equivalent to around €46 per kilogram) from 1 January 2024[18].

A development worth noting is the recent reduction in this rate. Firmly determined to eliminate the harmful tobacco smoking, Sweden reduced taxes on *snus* by 20% while increasing taxes on cigarettes by 9%, effective from November 2024[19].

Thus Sweden widened drastically the tax differential between traditional tobacco and its popular local smoke-free alternative. In addition to the wide availability of *snus* in the country, a product even banned in most other EU member states[20], this illustrates how Sweden implements a very efficient harm reduction strategy.

Therefore it has been no surprise that it is Sweden that became the first European "smoke-free" country. On 13 November 2024 the country's public health agency released new statistics showing that only 5.3% of all adults in Sweden, including immigrants, currently smoke. Moreover, smokers are just 4.5% of Swedish-born adults. The latter is below the globally recognised benchmark of 5% for categorising a country as "smoke-free". [21]

HEALTH GAINS IF BULGARIA WERE LIKE SWEDEN

All in all evidence suggests huge unused potential in Bulgaria for encouraging a more decisive switch away from smoked cigarettes to smoke-free tobacco products. While Bulgarians tend to grasp HTPs and e-cigarettes slowly as the main alternative, in Sweden *snus* has already been the successfully proven substitute. As seen above, the well-structured tax regime in Sweden is a key contributor to the positive trend towards a smokeless environment: an approach Bulgaria would do well to emulate.

The health profile of Bulgaria will benefit substantially if like Sweden it adopts policies which are differentiating in relative favour of smokeless tobacco products.

If hypothetically smoking prevalence fell from 37% (as per the latest Eurobarometer, 2024) to 4.5%, the recently achieved rate for Swedish-born adults conferring Sweden the "smoke-free" status, this would represent around 88% reduction.

Whereas such a slump in prevalence could hardly result from outright cessation of smoking, at least not over a plausible near horizon, a more realistic scenario would be to achieve this by converting from traditional tobacco smoking to non-combustible alternatives. Conditional

[17] Source: Eurobarometer (2024, pp 33-34).
[18] Source: Swedish Tax Agency; retrieved from https://www.skatteverket.se/servicelankar/otherlanguages/inenglishengelska/businessesandemployers/startingandrunningaswedishbusiness/payingtaxesbusinesses/tobaccotax/excisedutyratesontobacco.4.676f4884175c97df419171b.html
[19] Source: https://www.clearingtheair.eu/en/post/sweden-reduces-price-of-snus-by-20-per-cent
[20] Source: https://smokefreesweden.org/wp-content/themes/smokefreesweden/assets/pdf/data/SFS_Missing%20the%20target_1%20Nov%202024.pdf
[21] Source: https://smokefreesweden.org/2024/11/13/breaking-news-swedes-first-in-world-to-become-smoke-free-its-a-lesson-for-the-world/

upon adequate policies if consistently pursued, like in Sweden, Bulgarians may be encouraged to replace smoked cigarettes with alternative smoke-free tobacco products. In view of the specific domestic market features and already established consumer preferences, Bulgarians may reasonably be expected to adopt more HTPs, for instance, just like Swedes have opted for their *snus*.

There will be sizeable health benefits as a result in Bulgaria, modelled as follows.

The quantification of the exact effects on health is in keeping with existing literature whereby conversion reduces the risk of a disease and, proportionately, the deaths and DALYs between 70% (lower bound) and 97% (upper bound). This range of risk reduction, with a medium degree of 83%, is mapped to three scenarios involving different conversion rates: 29%, 44% and 88%. These are termed "one third Swedish", "half Swedish" and "full Swedish" scenarios, respectively.

These scenarios and risk-reduction rates are applied to the latest available data as extracted from the Institute for Health Metrics and Evaluation database. The simulation thus generates the following results with regard to reduced deaths in Bulgaria (Table 6).

Table 6. Deaths which could have been averted in Bulgaria annually (number)

		One third Swedish	Half Swedish	Full Swedish
Risk reduction assumption 83% (medium)				
All ages	Lung cancer	725	1 100	2 200
	COPD	179	272	544
	IHD	855	1 298	2 596
	Stroke	495	751	1 503
total all ages/4 diseases		2 255	3 421	6 842
15-49 years	Lung cancer	39	60	119
	COPD	5	8	15
	IHD	112	169	339
	Stroke	46	70	139
subtotal 15-49 years/4 diseases		202	306	613
50-74 years	Lung cancer	590	896	1 792
	COPD	115	175	349
	IHD	582	883	1 766
	Stroke	335	509	1 017
subtotal 50-74 years/4 diseases		1 623	2 462	4 924
Risk reduction assumption 70% (low)				
All ages	Lung cancer	611	928	1 855
	COPD	151	229	459
	IHD	721	1 095	2 189
	Stroke	418	634	1 267
Total all ages/4 diseases		1 902	2 885	5 771

15-49 years	Lung cancer	33	50	101
	COPD	4	7	13
	IHD	94	143	286
	Stroke	39	59	117
subtotal 15-49 years/4 diseases		170	258	517
50-74 years	Lung cancer	498	756	1 511
	COPD	97	147	295
	IHD	491	745	1 489
	Stroke	283	429	858
subtotal 50-74 years/4 diseases		1 369	2 076	4 153
Risk reduction assumption 97% (high)				
All ages	Lung cancer	847	1 286	2 571
	COPD	209	318	636
	IHD	1 000	1 517	3 033
	Stroke	579	878	1 756
Total all ages/4 diseases		2 635	3 998	7 996
15-49 years	Lung cancer	46	70	140
	COPD	6	9	18
	IHD	130	198	396
	Stroke	54	81	163
subtotal 15-49 years/4 diseases		236	358	716
50-74 years	Lung cancer	690	1 047	2 094
	COPD	135	204	408
	IHD	680	1 032	2 064
	Stroke	392	594	1 189
subtotal 50-74 years/4 diseases		1 896	2 877	5 755

Note: Scenario "one third Swedish" applies 29% conversion rate; Scenario "half Swedish" applies 44% conversion rate; Scenario "full Swedish" applies 88% conversion rate.

The above demonstrates that applying risk reduction strategies as a result of which traditional smokers in Bulgaria opt to dump cigarettes by switching to non-combustible products would have saved nearly 8 000 lives in Bulgaria in 2021.

Under the most conservative scenario of conversion of 29% of smokers (i.e. one third of the difference between smoking prevalence in Bulgaria and Sweden) and assuming risk reduction at the lower bound of 70%, close to 2 000 deaths would have been averted in Bulgaria in that same year.

Across the entire population overall, as well as among those under 50, the risk reduction alternatives could lead to avoidance of most deaths from IHD. Among those aged 50 and

above the greatest positive impact would have been observed in averting deaths from lung cancer.

Under all three scenarios and risk reduction assumption rates by far most lives would have been saved among the elderly.

The analysis is then complemented by simulating all potential reductions in DALYs in Bulgaria (Tables 7). This illustrates further how the disease burden of morbidity, in addition to mortality, would have been eased in Bulgaria if reducing the risk factor of tobacco smoking in degrees similar to Sweden.

Table 7. DALYs which could have been reduced in Bulgaria (number)

		One third swedish	Half swedish	Full swedish
Risk reduction assumption 83% (medium)				
All ages	Lung cancer	19 490	29 571	59 142
	COPD	5 192	7 877	15 754
	IHD	24 081	36 537	73 074
	Stroke	13 851	21 016	42 031
total all ages/4 diseases		62 614	95 001	190 002
15-49 years	Lung cancer	1 785	2 708	5 416
	COPD	377	572	1 145
	IHD	5 238	7 947	15 894
	Stroke	2 444	3 709	7 418
subtotal 15-49 years/4 diseases		9 844	14 936	29 872
50-74 years	Lung cancer	16 296	24 724	49 449
	COPD	3 789	5 748	11 496
	IHD	16 685	25 316	50 631
	Stroke	9 827	14 910	29 819
subtotal 50-74 years/4 diseases		46 596	70 698	141 395
Risk reduction assumption 70% (low)				
All ages	Lung cancer	16 437	24 939	49 879
	COPD	4 378	6 643	13 286
	IHD	20 310	30 814	61 629
	Stroke	11 682	17 724	35 448
Total all ages/4 diseases		52 807	80 121	160 242
15-49 years	Lung cancer	1 505	2 284	4 567
	COPD	318	483	965
	IHD	4 417	6 702	13 404
	Stroke	2 062	3 128	6 256
subtotal 15-49 years/4		8 302	12 596	25 193

diseases				
50-74 years	Lung cancer	13 743	20 852	41 704
	COPD	3 195	4 848	9 696
	IHD	14 072	21 351	42 701
	Stroke	8 288	12 574	25 149
subtotal 50-74 years/4 diseases		39 298	59 625	119 249
Risk reduction assumption 97% (high)				
All ages	Lung cancer	22 778	34 559	69 118
	COPD	6 067	9 206	18 411
	IHD	28 143	42 700	85 400
	Stroke	16 188	24 560	49 121
Total all ages/4 diseases		73 176	111 025	222 050
15-49 years	Lung cancer	2 086	3 165	6 329
	COPD	441	669	1 338
	IHD	6 121	9 287	18 574
	Stroke	2 857	4 334	8 669
subtotal 15-49 years/4 diseases		11 504	17 455	34 910
50-74 years	Lung cancer	19 044	28 895	57 789
	COPD	4 428	6 718	13 435
	IHD	19 500	29 586	59 172
	Stroke	11 484	17 424	34 849
subtotal 50-74 years/4 diseases		54 456	82 623	165 245

Note: Scenario "one third Swedish" applies 29% conversion rate; Scenario "half Swedish" applies 44% conversion rate; Scenario "full Swedish" applies 88% conversion rate.

Risk reduction from converting to smokeless alternative tobacco therefore would have reduced DALYs in Bulgaria by up to 222 050 in 2021.

If only 29% of smokers converted to such alternatives, and if assuming the risk reduction at the lower bound of 70%, DALYs in Bulgaria would have gone down by 52 807.

In 2021 most DALYs would have been averted from IHD: both for the population as a whole and within the two main age sub-groups.

Looking at the age groups again, strongest risk-reduction benefits would have been observed among the elderly suffering from the four diseases where tobacco is the major risk factor.

Thus the above simulations under different "what-if" scenarios yield compelling evidence. Bulgaria would experience very significant health gains if pursuing risk-reduction strategies analogous to the ones that have guided Sweden along the road to the impressive outcome of becoming the first country freed from tobacco smoking in Europe.

CONCLUSIONS

Tobacco smoking is the major risk factor for NCDs, particularly for tracheal, bronchus and lung cancer, chronic obstructive pulmonary disease, ischemic heart disease, and stroke. There is substantial health burden from these diseases across the globe and in Europe particularly. Although tobacco consumption overall is declining over the years, smoking prevalence remains high.

There are huge variations within Europe, however. Bulgaria occupies the pitiful top place as EU's smoking champion, prevalence even going slightly up in recent years. At the other end of the spectrum lies Sweden: a country which just remarkably succeeded in attaining the status of the first smoke-free country in Europe.

Sweden's success could largely be attributed to its public policies, notably in implementing well-targeted taxation of tobacco products differentiating them by their riskiness and favouring the conversion to smokeless tobacco. Therefore an analysis of the two polar EU cases is worthwhile, studying the Swedish experience and drawing from it relevant strategies that could be applied in Bulgaria to help it reduce the health burden of smoking.

Thus the aim of the present analysis is to explore the question of how smoking prevalence, hence the health burden, in Bulgaria would be reduced if it adopted Sweden-type policies.

Whereas tobacco harm-reduction in Sweden has built upon the customary preference for *snus* as the most favoured non-combustible tobacco alternative in the country, Bulgarian policymakers could tackle other smoke-free tobacco alternatives currently gaining popularity such as HTPs.

Assuming well-designed and targeted policies to replicate the impressive conversion rates already attained in Sweden, several scenarios are simulated above to produce quantitative assessments of the potential health benefit in Bulgaria. The results are well worth highlighting and considered by policymakers. By calculations on the basis of latest available data, the model applied here reveals that Bulgaria could have saved almost 8 000 lives in one year. Furthermore, reproducing the Swedish experience in Bulgaria could have provided a reduction in DALYs of up to 222 050 annually.

Such a path from heavy smoking to a smoke-free environment is worth exploring.

REFERENCES

Beresniak, A., Bremond-Gignac, D., Dupont, D. and Duru, G. (2024). Reevaluating health metrics: Unraveling the limitations of disability-adjusted life years as an indicator in disease burden assessment. World Journal of Methodology, 15(1). doi:https://doi.org/10.5662/wjm.v15.i1.95796.

Chaloupka, F.J. (1999). How Effective are Taxes in Reducing Tobacco Consumption? In: N. Soguel and C. Jeanrenaud , eds., Valuing the Cost of Smoking: Assessment Methods, Risk Perception and Policy Options. Springer, pp.205–218.

Conte Grand, M. (2014). Simple Analytics of Disability Adjusted Life Years (DALYS). SSRN Electronic Journal. doi:https://doi.org/10.2139/ssrn.2505138.

Devleesschauwer, B., Havelaar, A.H., Maertens de Noordhout, C., Haagsma, J.A., Praet, N., Dorny, P., Duchateau, L., Torgerson, P.R., Van Oyen, H. and Speybroeck, N. (2014). DALY calculation in practice: a stepwise approach. International Journal of Public Health, 59(3), pp.571–574. doi:https://doi.org/10.1007/s00038-014-0553-y.

Eurobarometer (2024) Attitudes of Europeans towards tobacco and related products. [online] Available at: https://europa.eu/eurobarometer/surveys/detail/2995 (Accessed: 10 January 2025).

European Commission (2023) Country Health Profiles. [online] Available at: https://health.ec.europa.eu/state-health-eu/country-health-profiles_en#country-health-profiles-2023 (Accessed: 10 January 2025).

Eurostat (2022) Tobacco consumption statistics. [online] Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Tobacco_consumption_statistics (Accessed: 10 January 2025).

Eurostat. (2024). GDP per capita, consumption per capita and price level indices. [online] Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=GDP_per_capita,_consumption_per_capita_and_price_level_indices (Accessed: 10 January 2025).

Furberg, H., Lichtenstein, P., Pedersen, N.L., Bulik, C. and Sullivan, P.F. (2006). Cigarettes and oral snuff use in Sweden: prevalence and transitions. Addiction (Abingdon, England), [online] 101(10), pp.1509–1515. doi:https://doi.org/10.1111/j.1360-0443.2006.01550.x.

Institute for Health Metrics and Evaluation (2021) 'The Global Burden of Disease (GBD) study database'. Available at: http://vizhub.healthdata.org/gbd-compare (Accessed: 10 January 2025).

Institute of Medicine (US) Committee on Social Security Cardiovascular Disability Criteria (2010). Ischemic Heart Disease. [online] National Library of Medicine. Available at: https://www.ncbi.nlm.nih.gov/books/NBK209964/. (Accessed: 10 January 2025).

López-Nicolás, Á. (2023) Tobacco taxes in the European Union: An evaluation of the effects of the European Commission's proposals for a new Tobacco Tax Directive on the markets for cigarettes and fine-cut tobacco. Tobacconomics Working Paper Series No. 23/8/1. Cartagena: Universidad Politécnica de Cartagena. Available at: https://www.economicsforhealth.org/files/research/869/working-paper-tobacco-taxes-eu-final-version-oct-2.pdf (Accessed: 10 January 2025).

López-Nicolás, Á. (2024) Tobacco Taxes in the European Union: An evaluation of the European Commission's Tobacco Tax Directive proposals for cigars, cigarillos, pipe tobacco, electronic cigarettes, heated tobacco products, and nicotine pouches. Tobacconomics Working Paper Series No. 24/2/1. Cartagena: Universidad Politécnica de Cartagena. Available at:

https://www.economicsforhealth.org/files/research/902/working-paper-tobacco-taxes-eu-other-products-final-md.pdf (Accessed: 10 January 2025).

Murray, C. J., and Lopez, A. D. (Eds.). (1996). The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Diseases, Injuries, and Risk Factors in 1990 and Projected to 2020. Cambridge: Harvard University Press.

Rehm, J. and Frick, U. (2010). Valuation of health states in the US study to establish disability weights: lessons from the literature. International Journal of Methods in Psychiatric Research, 19(1), pp.18–33. doi:https://doi.org/10.1002/mpr.300.

Solberg, C.T., Norheim, O.F. and Barra, M. (2017). The disvalue of death in the global burden of disease. Journal of Medical Ethics, 44(3), pp.192–198. doi:https://doi.org/10.1136/medethics-2017-104365.

Steenland, K. and Armstrong, B. (2006). An Overview of Methods for Calculating the Burden of Disease Due to Specific Risk Factors. Epidemiology, 17(5), pp.512–519. doi:https://doi.org/10.1097/01.ede.0000229155.05644.43.

Tax Foundation (2024) Cigarette Taxes in Europe, 2024. [online] Available at: https://taxfoundation.org/data/all/eu/cigarette-taxes-europe-2024/ (Accessed: 10 January 2025).

World Health Organization (2023a) Tobacco: fact sheet. [online] Available at: https://www.who.int/news-room/fact-sheets/detail/tobacco [Accessed 10 January 2025].

World Health Organization (2023b). WHO Report on the Global Tobacco epidemic, 2023 Protect People from Tobacco Smoke Fresh and Alive. [online] Available at: https://www.who.int/publications/i/item/9789240077164 [Accessed 10 January 2025].

World Health Organization (2024) WHO global report on trends in prevalence of tobacco use 2000–2030. Geneva: World Health Organization. Available at: https://www.who.int/publications/i/item/9789240088283 (Accessed: 10 January 2025).

Zhou, B., Zang, R., Zhang, M., Song, P., Liu, L., Bie, F., Peng, Y., Bai, G. and Gao, S. (2022). Worldwide burden and epidemiological trends of tracheal, bronchus, and lung cancer: A population-based study. eBioMedicine, [online] 78. doi:https://doi.org/10.1016/j.ebiom.2022.103951.