

COMMENT

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If there had been no snus in Sweden: the impact of snus on mortality attributable to smoking

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Abstract

In Sweden, there has been a massive transition from cigarette smoking to snus, the Swedish kind of low-toxicity oral tobacco. This product poses very little health risk compared to cigarettes, as illustrated by the fact that males in Sweden have Europe's lowest level of mortality attributable to smoking. The current investigation estimates how high the smoking-attributable mortality in Sweden would have been if there had been no snus in Sweden. It is made up by comparisons between observed Swedish data and two scenarios without snus: a group of comparable countries, and, a hypothetical Sweden with no snus use. Both comparisons suggest that around 3000 lives per year have been saved by the use of snus in Sweden.

Keywords Sweden, Cigarette smoking, Snus, Smoking-attributable mortality, Tobacco harm reduction, Public health

Background

The prevalence of smoking among males in Sweden is substantially lower than in all other European Union (EU) countries [1]. It is generally recognized that this is largely due to the fact that snus use in Sweden has both reduced initiation of smoking and increased cessation of [smoking [2, 3]. Less attention has been paid to the subsequent effects in terms of reduction in mortality attributable to smoking. In the current investigation the impact of snus in these respects is evaluated by comparing mortality attributable to smoking observed in Sweden with two scenarios with virtually no snus use. These comparisons illustrate how snus has saved many lives in Sweden and the importance of public health policies strongly supporting snus and other low-risk tobacco and nicotine products as alternatives to cigarettes.

Comparison between Sweden and similar countries with virtually no snus use

The potential of snus to reduce smoking-attributable mortality can be elucidated by comparing Swedish data on smoking-attributable mortality with corresponding data from comparable countries with virtually no snus. Switzerland and most EU countries outside Sweden have virtually no snus use and might therefore be considered for comparison. However, comparability between countries with respect to mortality presupposes similarity in terms of level of development. A measure of this level is every year determined by the United Nations Development Program. This measure, the Human Development Index (HDI), summarizes the average performance of different countries in three basic areas: life expectancy, educational attainment and standard of living [4]. According to data from 2021, Switzerland has the highest HDI index (0.965). Bulgaria has the lowest index in the EU (0.796), and Somalia is lowest in the world (0.380) [5].

The comparison countries were selected among virtually snus-free European countries who had similar level of development as Sweden — i.e. their average HDI being

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as close as possible to that of Sweden (see Table 1). Since comparisons of death rates in different countries are affected by differences in age distribution, the analysis is based on the age-standardized smoking-attributable death rate for Sweden compared with the average of age-standardized smoking-attributable death rates for the comparison countries.

The analysis is based on the data shown in Table 1. The Global Burden of Disease study (GBD) has estimated that for males in Sweden the age-standardized death rate attributable to smoking in 2021 is 44 per 100,000 [6]. In the countries that are virtually snus-free but otherwise similar to Sweden, the corresponding death rates are substantially higher than in Sweden. It can be assumed that in a Sweden without snus, the death rate attributable to smoking would have been of roughly the same magnitude as the average for the “snus-free” comparison countries, 73 per 100,000. It could then be estimated that, if there had been no snus in Sweden, the mortality attributable to smoking among males in 2021 would have been around $73/44 \approx 1.7$ times as high as now observed.

The number of deaths attributable to smoking among males in Sweden in 2021 was estimated by the GBD to be 4772. The corresponding number in a Sweden without snus could then be around $4772 \times 1.7 = 8112$. The difference between these alternatives suggests that snus use among males in Sweden has saved around 3000 lives per year at the beginning of the 2020s.

Swedish males started the transition from cigarettes to snus already in the later half of the twentieth century, while Swedish females did not start such a transition until

quite recently [7]. Further, the different development among men and women regarding transition from cigarettes to snus is reflected in the development of annual numbers of smoking-attributable deaths in the period 1990 to 2021. GBD data indicate that among males there was a continuous decline from 8653 in 1990 to 4772 in 2021. Among females there was a rather constant level around 4000 from 1990 to 2017 followed by a decline to 3757 in 2021. These observations suggest that the transition from cigarettes to snus among females in Sweden has not yet had time to contribute to any major reductions of mortality. This suggestion is supported by data in Table 1 showing that for females in Sweden the death rate attributable to smoking is just negligibly lower than the average for the comparison countries. But, if the present transition practices will persist, snus can save many lives among females as well and thereby widen the gap to countries that are virtually free from snus use.

Comparison between observed data and a hypothetical scenario: “If there had been no snus in Sweden”

Another way to highlight how snus has saved lives in Sweden is to compare actually observed data with a hypothetical scenario: “If there had been no snus in Sweden”. The hypothetical scenario is derived from a number of reasonable assumptions in combination with findings from a large nationwide representative population survey [3]. Data from that survey are shown in the left-hand sections of Tables 2 and 3. Columns A–E represent categories of pathways that different groups of respondents have used for progressing/changing of their tobacco use from the start of daily tobacco use to the status at the time of the survey. The key outcome is the proportion that, possibly after various changes, have maintained daily smoking at the time of the survey. This percentage is highest in category A, where no daily snus use has been included. In the categories which also include daily snus use, the percentage of maintained daily smoking is significantly lower. This is another proof of the potential of snus to keep down smoking.

Since there is no snus in the hypothetical scenario, there will be just two categories of onset conditions for pathways of tobacco use, start or no start of daily smoking. An assessment of the proportion of maintained daily smoking in the hypothetical scenario can be based on three assumptions regarding how the individuals in categories A–E would have been located in the categories G and H in the hypothetical scenario.

1. The individuals in categories A, B and D have all started daily smoking at some stage. They would presumably have started daily smoking also if there had

Table 1 Mortality data for virtually snus-free countries with similar living conditions as Sweden as measured by their Human Development Index, HDI

Countries with virtually no snus use	HDI 2021 [5]	GBD estimates for 2021. Age standardised death rates per 100,000 attributable to smoking [6]	
		Males	Females
Switzerland	0.965	55	20
Germany	0.948	77	25
Denmark	0.947	95	53
Ireland	0.946	58	32
Netherlands	0.941	77	38
Belgium	0.938	81	25
United Kingdom	0.931	69	40
Average of above countries	0.945	73	33
Sweden	0.949	44	29

Table 2 Pathways for progression of tobacco use in males in Sweden

	Males in Sweden Findings from a nationwide representative survey 2003–2011 [3]						Hypothetical scenario: “If there had been no snus in Sweden”		
	A	B	C	D	E	F	G	H	I
Categories of onset conditions	Start by daily smoking, never daily snus use	Start by daily smoking, later daily snus use	Start by daily snus use, never daily smoking	Start by daily snus use, later daily smoking	Never any daily tobacco use	TOTAL	Started daily smoking	Never started daily smoking	TOTAL
n	6943	3737	4144 (1658 + 2486)	877	12,601	28,302	13,215	15,087	28,302
Maintained daily smoking at the time of the survey n(%)	2790 (40%)	490 (13%)	0 (0%)	210 (24%)	0 (0%)	3490 (12%)	5286 (40%)	0 (0%)	5286 (19%)

Table 3 Pathways for progression of tobacco use in females in Sweden

	Females in Sweden Findings from a nationwide representative survey 2003–2011 [3]						Hypothetical scenario: “If there had been no snus in Sweden”		
	A	B	C	D	E	F	G	H	I
Categories of onset conditions	Start by daily smoking, never daily snus use	Start by daily smoking, later daily snus use	Start by daily snus use, never daily smoking	Start by daily snus use, later daily smoking	Never any daily tobacco use	TOTAL	Started daily smoking	Never started daily smoking	TOTAL
n	11,794	961	484 (194 + 290)	43	19,091	32,373	12,942	19,431	32,373
Maintained daily smoking at the time of the survey n(%)	4694 (40%)	129 (13%)	0 (0%)	17 (40%)	0 (0%)	4890 (15%)	5177 (40%)	0 (0%)	5177 (16%)

been no snus in Sweden. In the hypothetical scenario they would then be located in category G.

- The individuals in category E have abstained from all daily tobacco use. They would presumably have abstained from daily smoking also if there had been no snus in Sweden. In the hypothetical scenario they would therefore be located in category H.
- The individuals in category C, have abstained from daily smoking, but they show a propensity for daily tobacco use by having started daily snus use. It can be assumed, that in the hypothetical scenario they would have started daily smoking to a similar extent as daily smoking was started in the total study population, 40% for males and 40% for females (see Tables 2 and 3). In the hypothetical scenario 40% of the males in category C (1658 individuals) and 40% of the females (194 individuals) would then be located in category G and the others in category H.

The individuals in category G would have had the same conditions for progressing their smoking behavior as those in category A, and it can therefore be assumed that they have the same proportion of maintained daily smoking; 40% for males and 40% for females.

Hypothetical scenario, males

In the hypothetical scenario there are 13,215 males who started daily smoking (category G) and 40% of them (i.e. 5286) are estimated to have maintained daily smoking. They constitute 19% of the total population of 28,302 individuals (category I). This is significantly higher than the corresponding proportion, 12%, in the actually observed scenario (category F). It is reasonable to assume that the numbers of deaths attributable to smoking in the hypothetical respectively the observed scenario are proportional to these percentages. According to the GBD estimates for 2021, the actual number of

deaths attributable to smoking among males in Sweden was 4772 [6]. In the hypothetical scenario the number of deaths attributable to smoking would then have been $(19/12) \times 4772 = 7556$. The difference, 2784, suggests that snus has saved almost 3000 lives per year among males in Sweden in the beginning of the 2020s.

Hypothetical scenario, females

For females there is no significant difference between the proportion of maintained daily smoking in the observed and the hypothetical scenario, 15% versus 16%. The disparity between males and females is well compatible with the development of tobacco use patterns in Sweden. While the transition from smoking to snus use among males started already in the later part of the twentieth century, it did not gain momentum among females until quite recently [7].

Limitations

The Human Development Index, HDI, is a useful tool to identify countries that have similar living conditions as Sweden, but the index may not precisely capture all aspects of the relevant conditions. Some of the estimates from the GBD study have fairly broad confidence intervals. In Table 2 and Table 3 the distribution of individuals over categories A–E, is based on actually observed data. The distribution over categories G–H, hypothetical scenario, is based on a combination of those observed data and certain assumptions which are built on logical reasoning but do still involve some uncertainty. With respect to the above limitations, it should be taken into account that the current investigation does not aim at finding highly accurate numerical results but to assess the order of magnitude of the impact of snus use on smoking-attributable mortality in Sweden.

Conclusions

Sweden's low smoking-attributable mortality relies on a record decrease in smoking. This development has not only been influenced by the increase in snus use but also by various measures, for example increased tobacco tax, smoking ban in certain premises, restrictions on marketing and sales etc. The implementation of such smoking control measures is quantified at country level by "The Tobacco Control Scale in Europe", TCS [8]. Sweden's TCS-score is below average and it is therefore not likely that these, officially recommended, measures can explain why males in Sweden have the lowest in Europe prevalence of smoking. On the other hand, the current investigation has yielded two comparisons that from different perspectives have produced well consistent data showing a strong association between the increase of snus use and the decrease of mortality. These findings support

the conclusion that the increase of snus use has been the major factor behind Sweden's low smoking-attributable mortality.

Although Sweden has lower smoking-attributable mortality than other EU countries, there are still almost 9000 such deaths per year (almost 10% of all), and the continued reduction appears to be slowing down [6]. This illustrates the need for official policies all over Europe to recognize the potential benefits of snus—either as an aid to stop smoking or as a means of switching to a far less harmful kind of nicotine use. But there are various obstacles that have to be overcome. For example, there is a widespread false belief that the harmfulness of tobacco would stem mainly from the nicotine and that therefore snus would be just as harmful as smoking. This misconception survives to a large extent despite the fact that the *British Medical Journal* already in 1976 published an article where it was determined that "People smoke for nicotine but they die from the tar." [9] Governments should support snus as a key element in tobacco harm reduction by strong action both in public education and legislation.

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Author contributions

L.R. designed the study, retrieved all data and prepared the manuscript.

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Data availability

The data presented in this article are available from: the Statistical Office of the European Union [1], the Royal College of Physicians London [2], Ramstrom et al. [3], the United Nations Development Programme [4, 5], The Institute for Health Metrics and Evaluation [6], The Public Health Agency of Sweden [7], Joosens et al. [8] and Russell [9]. An early version of this article was posted as a preprint on Qeios. (<https://www.queios.com/read/FUX4PH>).

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The author declares no competing interests.

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