

## Mortality attributable to tobacco among men in Sweden and other European countries: an analysis of data in a WHO report

Lars Ramström<sup>1\*</sup> and Tom Wikmans<sup>2</sup>

### Abstract

**Background:** It is well known that Swedish men have lower tobacco-related mortality than men in other European countries, but there are questions that need further investigation to what extent this is related to the specific patterns of tobacco use in Sweden, where use of snus, the Swedish low-nitrosamine oral tobacco, dominates over smoking in men but not in women. The recent *WHO Global Report: Mortality Attributable to Tobacco* provides a unique set of estimates of the health burden of tobacco in all countries of the world in the year 2004, and these data can help elucidating the above-mentioned questions.

**Methods:** For Sweden and all other European Union Member States mortality data for a number of tobacco-related causes of death were extracted from the WHO Report. The size of the mortality advantage for selected causes of death in different age groups of Swedish men compared to men of the same age in Europe as a whole was calculated in terms of ratios of death rates attributable to tobacco. Differences between age groups with respect to tobacco-related mortality were analyzed with respect to differences in terms of development and status of smoking and snus use. The analyses also paid attention to differences between countries regarding tobacco control regulations.

**Findings:** Among men in the European Union Member States the lowest level of mortality attributable to tobacco was consistently found in Sweden, while Swedish women showed levels similar to European average. A strong co-variation was found between the mortality advantage and the degree of dominance of snus use in the different age groups of Swedish men. Among Swedish women there are no age groups with dominant use of snus, and similar observations were therefore not possible for women.

**Conclusion:** The above findings support the assumption that the widespread use of snus instead of cigarettes among Swedish men may be a major part of the explanation behind their position with Europe's lowest mortality attributable to tobacco.

**Keywords:** Mortality, Snus, Smoking, Sweden, Europe



Article

# Patterns of Smoking and Snus Use in Sweden: Implications for Public Health

Lars Ramström <sup>1,\*</sup>, Ron Borland <sup>2,3</sup> and Tom Wikmans <sup>4,†</sup>

<sup>1</sup> Institute for Tobacco Studies, Kanalvägen 17, SE-18338 Täby, Sweden

<sup>2</sup> Melbourne School of Population and Global Health, University of Melbourne, 235 Bouverie St, Carlton Victoria 3053, Australia; Ron.Borland@cancervic.org.au

<sup>3</sup> Nigel Gray Fellowship Group, Cancer Council Victoria, 615 St. Kilda Road, Melbourne, Victoria 3004, Australia

<sup>4</sup> LiQuSa-Research, Industrial Business Residence, Örsätter, SE-597 94 Åtvidaberg, Sweden; tom@liqusa.com

\* Correspondence: lars.ramstrom@tobaccostudies.com; Tel.: +46-709745787

† Deceased February 2016.

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**Abstract:** There has been concern that the availability of alternative less harmful forms of nicotine might inhibit smoking cessation and/or encourage those who would not otherwise have smoked to do so. The plausibility of such effects can be best assessed by looking at population trends in use of smoking in relation to alternatives. This paper looks at the relationships between snus use and smoking in Sweden. Analyses are based on a data set for the period January 2003 to February 2011 from a long-term study covering nationally representative samples of the Swedish population aged 18–79, with a total study population of 60,675 individuals. Questionnaires made it possible to identify detailed tobacco use categories and use trajectories. The results showed that uptake of snus use is much more common in males than females. Those who began daily tobacco use using snus were much less likely to subsequently take up smoking than those who had not, both among males (17.6% vs. 45.9%), and females (8.2% vs. 40.2%). Further, among those who started using snus after starting as smokers, 76.3% of men and 71.6% of women had stopped smoking completely, including 31.5% of the men and 28.6% of the women who had quit all forms of tobacco. Indeed, those who were primary snus users were also more likely to have quit altogether than those who only ever smoked. Snus was also reported as the most common smoking cessation aid among men and yielded higher success rates than nicotine replacement therapy and other alternatives. As conclusions, snus has both contributed to decreasing initiation of smoking and, when used subsequent to smoking, appears to facilitate smoking cessation. All these effects suggest that the availability and use of snus has been a major factor behind Sweden's record-low prevalence of smoking and the lowest level of tobacco-related mortality among men in Europe.

**Keywords:** public health; snus; smokeless tobacco; smoking cessation; tobacco control; harm reduction



# Sweden's Pathway to Europe's Lowest Level of Tobacco-Related Mortality

Lars Ramström, Institute for Tobacco Studies, Täby, Sweden

Email: lars.ramstrom@tobaccostudies.com

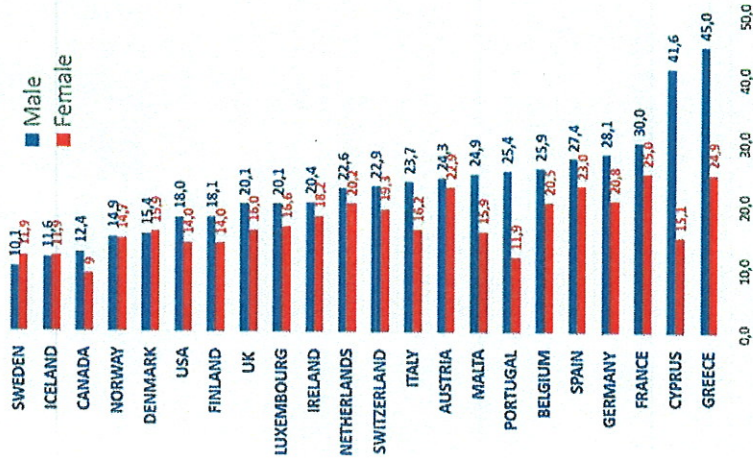
## Background

In the region of Western Europe + North America there are substantial inter-country differences with regard to the use of tobacco and its health consequences.

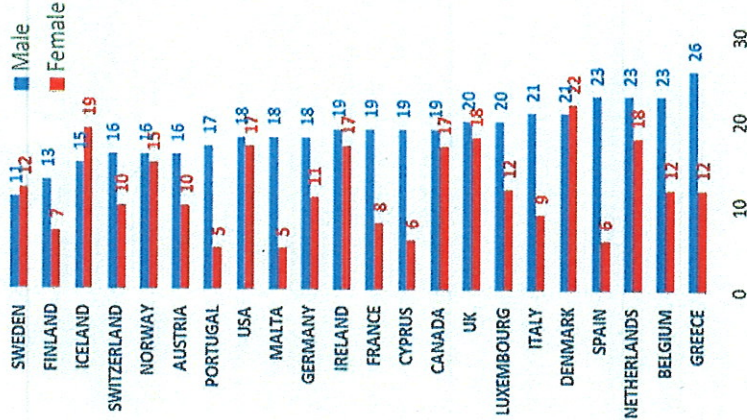
Sweden stands out in two respects:

### Western Europe + North America Percent daily smoking 2015

Source: WHO 2017 Report, Global Tobacco Epidemic



### Western Europe + North America Percent of total deaths attributable to tobacco 2016



- For males, both prevalence of daily smoking and mortality attributable to tobacco is lower in Sweden than in any other of these countries
- For females, both prevalence of daily smoking and mortality attributable to tobacco is higher than for males, which is extremely unusual in the other countries.

Sweden's current position has been achieved by dramatic changes of tobacco use patterns during the last 50 years. The objective of this study is to describe this development and to analyse the incentives and impediments that have influenced the course of the changes.

## Methods

Timelines of tobacco use prevalence and tobacco control measures including tax policies have been retrieved from various reports and official sources of statistics. Details of initiation and cessation practices have been retrieved from peer-reviewed articles based on large national surveys in Sweden. These pieces of evidence have been combined to analyse the development of tobacco use in Sweden from the 1970s to today. Data on mortality attributable to tobacco have been retrieved from the database of *The Global Burden of Diseases, Injuries, and Risk Factors Study 2016*, *GBD 2016 (Lancet 2017; 390: 1345-422)* available on the website of *The Institute for Health Metrics and Evaluation (IHME)*.

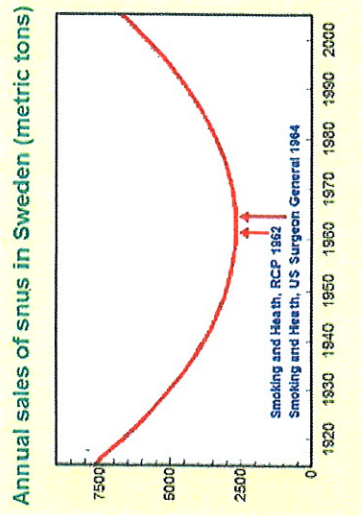
## Results

There have been profound changes of tobacco use patterns in Sweden during the last 50 years, both with regard to smoking and use of snus, the Swedish kind of low-toxicity oral snuff. Among males the prevalence of smoking has been steadily declining to a sixth of the level in 1963, while there has been a sharp increase in the use of snus. Among females the prevalence of smoking has been declining at a slower pace than among men and from the 1980s prevalence of smoking has been higher among females than males. Prevalence of snus use has been increasing among females as well, but is still far below the level of males.

### Prevalence of daily tobacco use in Sweden

	1963	1976	1986	1996	2006	2016
Smoking	49%	43%	24%	19%	13%	8%
Snus use	No data	34%	28%	23%	15%	10%
Male	No data	9%	19%	20%	20%	18%
Female	No data	No data	1%	1%	4%	4%

Sources: 1963, Statistics Sweden, 1976-1986, NIS surveys, 1996, Statistics Sweden, 2006-2016, The National survey of Public Health



Historically, tobacco use in Sweden had been totally dominated by snus, but in the early 1900s cigarettes started to gain an increasing share of tobacco consumption, and consumption of snus began to decline. However, in the late 1960s the trends were reversed. An important factor behind this change was the emerging scientific evidence of the health risks of smoking which were disclosed in the 1962 report of The Royal College of Physicians in London and the 1964 report of the US Surgeon General. These new pieces of evidence received a lot of attention in Sweden, both in news media and in professional circles. Many smokers who were encouraged to escape the health risks of smoking switched to snus. Both the increase of snus use and the decrease of smoking were much faster among males than among females.

The increase of snus consumption continued till 2006. The two following years there was a substantial drop due to exceptional increases of tobacco excise duties, much higher on snus than on cigarettes, so that switching from cigarettes to snus became less attractive. From 2009 the trend for snus consumption was again upward but slower than before.

	Increases of excise duties on tobacco in Sweden	
	Cigarettes	Snus
From 2006 to 2007	+15%	+100%
From 2007 to 2008	+ 9%	+ 37%
From 2006 to 2008	+25%	+174%



### Role of snus in initiation of smoking

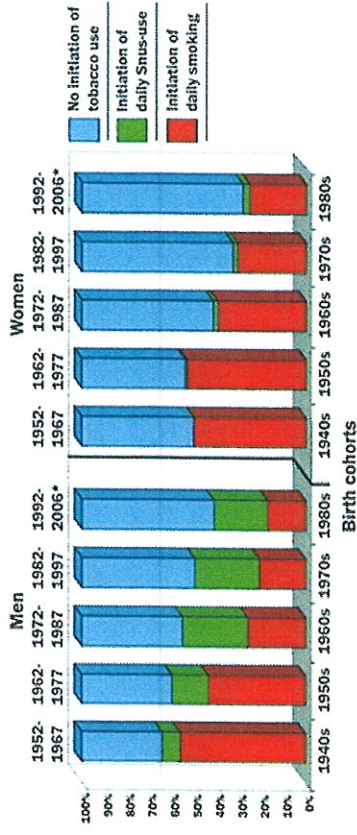
One of six boys and some few girls are 'Snus-starters', i.e. they have started daily tobacco use by initiating snus use. How does that influence the probability for initiation of smoking?

The rate of initiation of smoking is much lower among Snus-starters than among those who have not started using snus, both for boys and girls. This suggests that starting with snus use can hamper initiation of smoking rather than serve as a gateway to smoking. A small fraction of Snus-starters take up smoking, but most of them, 63%, do later quit smoking completely and 24% quit snus use as well and become totally tobacco-free.

Another question on how snus influences initiation of smoking deals with whether increasing snus use adds to previous tobacco use in the population or replaces part of it. This question has been addressed by large population studies that have analysed the development in Sweden during the last 50 years.

### Patterns of initiation at different time spans.

As reflected by the birth cohort that dominated initiation in each time span.



These data for consecutive birth-cohorts show that patterns of initiation have changed substantially during the later half of the last century. The green segments of the bars, representing initiation of snus use, show striking increases from

decade to decade, particularly among males, while the corresponding red segments, representing initiation of smoking, show sharp decreases. The blue segments, representing non-initiation of tobacco use, show that the increase of snus use has been associated with a distinct increase of the fraction of those who abstain from initiation of any tobacco use. These data demonstrate that an increasing initiation of snus use is well compatible with a decreasing total recruitment to tobacco use, and suggest that the increasing number of Snus-starters are mainly drawn from presumptive smokers.

### Role of snus in cessation of smoking

The vast majority of all those who have initiated daily smoking have done so without previous experience of snus use. But in this category there are substantial proportions, 35% among males, 8% among females, who have later taken up daily snus use. Population studies have charted the subsequent development of tobacco use patterns in this category.

Current tobacco use status among 'Ever daily smokers'				
	Quit daily smoking	Daily smoking no snus use	Daily snus use no smoking	Daily dual use
With uptake of snus use	Males 87%	3%	44%	9%
	Females 86%	4%	41%	7%
Without uptake of snus use	Males 60%	36%	N.A.	N.A.
	Females 60%	38%	N.A.	N.A.

A very high proportion, 87%, of male smokers who take up snus use quit daily smoking. Equal figures for women as well. Some of these smokers switch to snus-use-only, and almost as many, 32%, do eventually quit snus use as

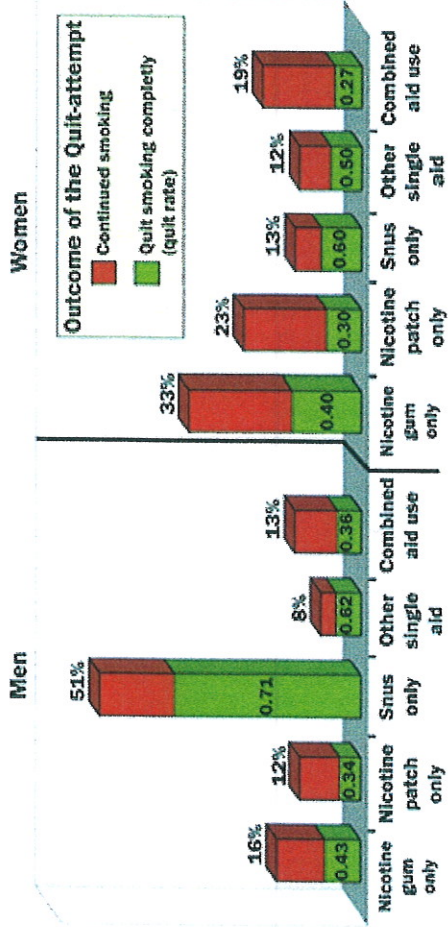
well and become free from any tobacco use. A small fraction will be dual users. They have lower cigarette consumption than remaining pure smokers and would therefore have decreased rather than increased their health risk. The low level of dual use suggests that dual use is mainly a transient stage serving as a stepping-stone to a non-smoking or an entirely tobacco-free endpoint.

The high quit rate among smokers with uptake of snus use should be compared with the quit rate among smokers without uptake of snus use. In that group the quit rate is much lower and the fraction of remaining daily smokers is around 10 times higher than among those with uptake of snus use.

These observations raise the question on the effectiveness of snus as a self-help cessation aid compared to approved NRT products for cessation.

### Percentages of "Self-help quit-attempts" made with different aids and

#### Outcome of the quit-attempt



This chart presents data regarding self-help quit attempts with use of different self-administered cessation aids and outcome of these attempts. The height of each bar illustrates the percentage of quit attempts that were made with the aid(s) in question as indicated numerically at the top of each bar. The segments of each bar represent outcome with the aid in question — failure (red) or success (green). The numerical data in the green segments indicate the proportion of successful quit attempts for each cessation aid.

Among men, snus is the most commonly used product, while among women nicotine gum or patch is more common. The successfulness figures show that use of snus as cessation aid yields higher success rates than any of the other alternatives — both for men and women.

The combination of high usage and high successfulness means that, among men, snus has been the most effective product for self-help smoking cessation. The size of each green segment corresponds to the quantity of successful quit attempts in the category in question. It can be calculated that among men "Snus only" was used in 64% of the successful quit attempts, while nicotine gum was used in 12% and the patch in 7%.

### Conclusions

- 50 years of increasing initiation of snus use in Sweden has been accompanied by decreasing initiation of smoking and increasing proportion of non-initiation of tobacco use.
- Snus use is not a gateway to smoking — instead it hampers initiation of smoking.
- Among smokers with uptake of daily snus use quit rates are much higher than among smokers without uptake of snus.
- Dual use of snus and cigarettes is rather uncommon and appears to be a transient stage, a stepping-stone towards smoke free or tobacco-free life.
- Snus as self-help aid for smoking cessation yields higher success rates than nicotine gum or patch.
- Among men the combination of high successfulness in individuals and the large extent of use has resulted in higher number of quitters with snus than quitters with nicotine gum/patch.
- Snus favours public health both by decreasing initiation of smoking and by increasing cessation of smoking.