

## Original Investigation

# The use of snus for quitting smoking compared with medicinal products

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## Abstract

**Introduction:** Given there are few experimental studies comparing the effects of snus and medicinal products for quitting smoking, self-reports from smokers who have used different methods for quitting smoking can be informative.

**Methods:** Fourteen thousand seven hundred and forty-four Norwegian men aged between 20 and 50 years were selected at random from a national representative web panel and sent a questionnaire by E-mail. Of the 7,170 (48.6%) who responded, there were 1,775 former and 1,808 current smokers. They were asked about the method they used and the outcome of their last attempt to quit smoking.

**Results:** In a regression model in which education, number of previous attempts to quit smoking, perception of risk, and age were controlled for, the odds ratio (OR) for reporting total abstinence at the time of the survey was significantly higher for those who had used varenicline ( $OR = 4.95, p < .006$ ) and snus ( $OR = 2.68, p < .001$ ) compared with those who had used nicotine chewing gum (reference  $OR = 1$ ). For smokers who reported that they had tried to quit with the help of snus, 62.4% reported that they still used snus at the time of the survey either daily (43.8%) or occasionally (18.6%). The proportion who still used medicinal nicotine products at the time of the survey was 9.5%.

**Discussion:** Compared with medicinal nicotine products, snus and varenicline increased the probability of quitting smoking completely, but snus seemed to maintain nicotine dependence.

## Introduction

In general, the Nordic health authorities do not recommend use of snus as a method for quitting smoking (Holm, Fisker, Larsen, Puska, & Halldórsson, 2009), although in Norway, they have recently agreed that health care personnel can recommend snus in individual cases of inveterate smokers (Norwegian Directorate of Health, 2009). However, studies have shown that snus is the preferred method for quitting among male smokers in Sweden and Norway, and this method is also used by an increasing number of women (Gilljam & Galanti, 2003; Lund, 2009a).

A consistent finding in Swedish (Gilljam & Galanti; Ramström & Foulds, 2006; Stenbeck, Hagquist, & Rosén, 2009) and Norwegian (Lund, 2009b; Scheffels & Lund, 2009) observational studies is that the quit rate for smoking is higher for snus users than for smokers who have no experience of use of snus. To our knowledge, other than a few small pilot studies (Mendoza-Baumgart et al., 2007; Tilashalski, Rodu, & Cole, 1998), no randomized controlled trials (RCT) or experimental studies have been carried out to compare the effect of snus and medicinal nicotine products on quitting smoking. In the absence of such studies, self-reported data have been used to shed light on the effect of the different methods for quitting smoking (Ramström & Foulds), although the degree of evidence is lower.

We examined the self-reported outcome of smokers' attempts to quit smoking using the following methods of quitting: snus, nicotine patches, nicotine chewing gum, bupropion (Zyban), and varenicline (Champix).

## Methods

An invitation to participate in the survey was sent by E-mail to 14,744 men aged 20–50 years in 2007, who had been randomly selected from a web panel of 62,000 Norwegians administrated by the international research agency Synovate. People were recruited to this web panel when they had participated in previous nationally representative population surveys, carried out by telephone, post, or personal interview and had agreed to receive future invitations to participate in surveys by E-mail. Self-recruitment to the panel was not possible. Of those invited to participate, 7,170 men (48.6%) responded. No significant differences at the 5% level were detected in the distributions of the national population and the respondents when compared by age and region.

The final sample consisted of 1,775 former daily or occasional smokers and 1,808 current daily or occasional smokers, a total of 3,583 people. Former smokers and smokers who had tried to quit were asked "Did you use some of these methods when you last tried to quit smoking (multiple answers possible)?" Response categories were nicotine gum, nicotine patch, snus, inhaler, Zyban, Champix, called the quitline, attended a course or consulted health personnel, and read brochures/self-help material (Table 1). The association between using

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**Table 1. Percentage using different methods for quitting smoking on last quit attempt among ever smokers, former smokers, and current smokers (multiple choice of methods possible), and ratio of former/current smokers for each quit-smoking method**

	Ever smokers (N = 3583)	Former smokers (N = 1775)	Current smokers (N = 1808)	Chi-square	p value	Ratio former/current smokers
Nicotine chewing gum	18.0 (n = 646)	9.4 (n = 166)	26.5 (n = 480)	179.2	<.001	0.35
Nicotine patch	10.3 (n = 368)	4.7 (n = 85)	15.7 (n = 284)	117.2	<.001	0.30
Snus	31.6 (n = 1134)	26.1 (n = 463)	37.1 (n = 671)	50.4	<.001	0.70
Inhaler	1.8 (n = 65)	0.9 (n = 16)	2.7 (n = 49)	16.5	<.001	0.33
Zyban	4.7 (n = 167)	2.6 (n = 47)	6.6 (n = 120)	32.1	<.001	0.39
Champix	1.1 (n = 38)	0.7 (n = 12)	1.4 (n = 26)	5.0	.026	0.50
Telephone helpline for smoking	1.3 (n = 48)	0.5 (n = 9)	2.2 (n = 39)	18.5	<.001	0.23
Help from health care personnel	3.6 (n = 128)	2.1 (n = 37)	5.0 (n = 91)	22.6	<.001	0.42
Self-help material	12.1 (n = 434)	7.5 (n = 133)	16.7 (n = 301)	70.6	<.001	0.45

different methods was measured by Pearson's coefficients that can range in value from -1 (a perfect negative relationship) to +1 (a perfect positive relationship). Use of one method predicts the use of another method if correlation between the two was positive and significantly different from 0 (no relationship). If use of one method reduced the probability to take up an additional method, the correlation had a negative sign (Table 2). Correlation coefficients significant at the .05 level were identified with a single asterisk, and those significant at the .01 level were identified with two asterisks.

The respondents were also asked "What was the result of your latest attempt to quit smoking?" The response categories were quit smoking completely, greatly reduced their cigarette consumption, reduced their cigarette consumption somewhat, and smoked about the same as before. The odds ratios (ORs) for reporting "quit smoking completely" (table 3), and then in another model "greatly reduced cigarette consumption" (table 4), were calculated using logistic regression controlling for method for quitting, length of highest completed education, number of previous attempts to quit, risk perception, and age. Only people who reported using only one of nicotine chewing gum, nicotine patches, snus, bupropion, or varenicline were included in the regression analysis. However, these respondents could have used other methods for quitting smoking, such as self-help materials, a telephone helpline for smoking, or consultation with health care personnel. In the model for Table 4,

respondents who had quit smoking completely were excluded from the analysis.

Perception of risk was measured using the question "On a scale from 1 to 7, where 1 is 'not dangerous' and 7 is 'very dangerous', how dangerous to health do you believe use of cigarettes is?" For use in the regression analysis, the scores were grouped into three values by splitting the sample in "low" (range 1-5), "medium" (6), and "high score" (7). Scores for age and number of attempts to quit were grouped into three values by splitting the sample at the values closest to the 33rd and 66th percentile.

## Results

Snus was the most common method for quitting smoking, followed by nicotine chewing gum, self-help materials, and nicotine patches (Table 1). The proportion of current smokers (and thus unsuccessful quitters) was greater than the proportion of former smokers (and thus successful quitters) for all methods for quitting smoking. However, the ratio of successful to unsuccessful quitters was higher for snus than for the other methods for quitting smoking.

Just under half ( $n = 1,727$ , 48.2%) of current or former smokers reported that they had used at least one of the nine specified methods to try to quit smoking on their last attempt.

**Table 2. Relationship between methods of quitting. Bivariate correlations (Pearson) with asterisks identifying significant associations**

	Snus	Nicotine chewing gum	Nicotine patch	Inhaler	Zyban	Champix
Snus						
Nicotine chewing gum	-0.439**					
Nicotine patch	-0.341**	0.253**				
Inhaler	-0.100**	0.124*	0.075			
Zyban	-0.271**	0.051*	0.107*	0.079**		
Champix	-0.149**	-0.018	0.066**	0.074**	0.125**	
Telephone helpline for smoking	-0.060*	0.110**	0.136**	0.101**	0.148**	0.146**
Help from health care personnel	-0.165**	0.147**	0.172**	0.096**	0.131**	0.083**
Self-help material	-0.162**	0.253**	0.154**	0.113**	0.145**	0.042

Note. \*\*Correlation at .01 (two tailed), \*correlation at .05 (two tailed).

**Table 3. Percentage (bivariate) and adjusted odds ratios (AORs) for having quit smoking completely at the last attempt for men aged 20–50 years. Odds ratio is adjusted for method of quitting, length of education, number of previous attempts to quit, risk perception, and age group**

	%	n/N	AOR	p value
Method				
Nicotine chewing gum (ref)	36.6	83/227	1.00	
Nicotine patch	38.9	35/90	0.96	.866
Snus	54.8	454/828	2.66	<.001
Zyban	47.5	28/59	1.56	.148
Champix	68.8	11/16	5.05	.006
Education				
Compulsory school (ref)	47.3	139/294	1.00	
Upper secondary school	49.9	722/1447	1.09	.736
University/college	62.0	1142/1842	1.54	.072
Previous attempts to quit				
1 (ref)	76.3	997/1307	1.00	
2–3	45.0	601/1335	0.40	<.001
4 or more	43.0	405/941	0.32	<.001
Score for perception of health risk				
Low (ref)	41.2	192/466	1.00	
Medium	47.9	374/780	1.23	.341
High	61.5	1437/2337	2.38	<.001
Age				
20–35 years	53.1	661/1244	1.00	
36–43 years	54.6	658/1205	1.96	<.001
44–50 years	60.3	684/1134	2.74	<.001

While use of a conventional method, recommended by the authorities, consistently increased the probability for also using one of the other recommended methods, use of snus was significantly negatively correlated with all the other methods of quitting smoking (Table 2).

The OR of reporting total abstinence at the time of the survey, when controlling for the other factors, was significantly higher for use of snus only than for use of one of any of the other methods for quitting. Fewer previous attempts to quit, concern about the health risks, and increasing age also increased the probability for having quit smoking (Table 3). In a model predicting “greatly reduced cigarette consumption,” the significant predictors were reduced to use of snus as the method for quitting and length of education (Table 4).

Of those smokers who reported that they had tried to quit by using snus, 62.4% reported that they still used snus at the time of the survey, either daily (43.8%) or occasionally (18.6%). People who had quit completely or greatly reduced their cigarette consumption with the help of snus were more likely to use snus on a daily basis than people whose attempt to quit had resulted in less change in cigarette consumption. In comparison, only 9.5% who had used nicotine chewing gum or nicotine patches at the last attempt to quit were still using these medicinal nicotine products at the time of the survey (Table 5).

**Table 4. Percentage (bivariate) and adjusted odds ratio (AOR) for having greatly reduced cigarette consumption at the last attempt for men aged 20–50 years. OR is adjusted for method of quitting, length of education, number of previous attempts to quit, risk perception and age group**

	%	n/N	AOR	p value
Method				
Nicotine chewing gum (ref)	18.1	41/227	1.00	
Nicotine patch	15.6	14/90	0.68	.394
Snus	25.5	211/828	3.01	<.001
Zyban	6.8	4/59	0.11	.323
Champix	18.8	3/16	8.94	.999
Education				
Compulsory school (ref)	9.9	29/294	1.00	
Upper secondary school	16.9	244/1447	3.49	.011
University/college	16.7	307/1842	4.38	.002
Previous attempts to quit				
1 (ref)	9.9	129/1307	1.00	
2–3	18.4	246/1335	0.68	.261
4 or more	21.8	205/941	0.46	.032
Score for perception of health risk				
Low (ref)	18.5	86/466	1.00	
Medium	17.7	138/780	1.02	.948
High	15.2	356/2337	1.52	.221
Age				
20–35 years	20.4	254/1244	1.00	
36–43 years	15.6	188/1205	1.54	.169
44–50 years	12.2	138/1134	1.69	.151

## Discussion

The study has shown that snus is the preferred method for quitting smoking for men in the age group 20–50 years. In addition, those using snus were more likely to have quit smoking completely or considerably reduced their cigarette smoking than users of medicinal smoking cessation products. This is the case despite the fact that users of medicinal nicotine products had a greater tendency to use additional methods for quitting smoking, which would normally increase the probability of a positive result. Use of snus seemed to be a more solitary method and might appear convenient for smokers who for some reason do not want to make use of the nicotine replacement therapy medicinal products. However, the survey indicates that use of snus as a method for quitting smoking may result in continued use after the attempt to quit. Such prolonged use of snus not only occurred among those who quit smoking or who greatly reduced their cigarette consumption but also among those who managed to change their cigarette consumption to a lesser extent.

## Limitations

The study has weaknesses common to other cross-sectional surveys using self-reported data. In contrast to an RCT, our study design does not ensure comparability of different groups. Thus, the possibility cannot be excluded that there are differences between the groups with regard to variables that can influence

**Table 5. Proportion of men 20–50 years old who used snus or medicinal nicotine products to quit smoking who were using these products at the time of the survey**

Method used at last quit attempt	Snus				Nicotine chewing gum/nicotine patch			
	Daily	Occasionally	Never	Total (N)	Daily	Occasionally	Never	Total (N)
Current use								
Outcome of last quit attempt								
Quitted smoking completely	54.0	11.2	34.8	100 (572)	5.1	4.2	90.7	100 (118)
Great reduction in cigarette consumption	59.8	14.7	25.6	100 (266)	10.9	9.1	80.0	100 (55)
Some reduction in cigarette consumption	15.5	37.9	46.6	100 (103)	0	4.7	95.3	100 (43)
Smokes as previously	8.3	34.8	56.9	100 (204)	0	5.9	94.1	100 (101)
All	43.8	18.6	37.6	100 (1145)	3.8	5.7	90.5	100 (317)

the outcome of an attempt to quit smoking, such as smoking intensity, smoking history, degree of nicotine dependence, and strength of intention to quit smoking. We have controlled for some variables (age, number of previous attempts to quit smoking, perception of risk, and education), which compensate to some extent—but not fully—for the absence of randomization. However, the current kind of observational studies are superior to RCT when it comes to evaluate effectiveness under real life conditions for different smoking cessation methods.

Another weakness is that we do not have data about the length of time from the attempt to quit smoking to the time of the survey. We cannot exclude the possibility that there are systematic differences between smokers who use the different methods, with regard to length of time between attempts to quit smoking or recall of quit attempts, but there is not any obvious reason that this would be the case. Respondents with an over-average interest in smoking cessation might be overrepresented in studies like this, but again, we find no reason that this interest should be systematically imbalanced between users of the different methods. Finally, the outcomes studied here are self-reports, and these are not validated with biochemical markers. Thus, there is a need to carry out experimental studies that can provide more robust evidence.

### Use of snus for smoking cessation rather than medicinal products

In accordance with other research (Lund, 2009a, 2009b; Scheffels & Lund, 2009), our study shows that medicinal nicotine products are not the most popular method chosen by Norwegian smokers to quit smoking. This is the case even though the pharmaceutical companies have, for nearly 25 years, widely advertised these products as effective stop-smoking aids, that they are widely accessible over-the-counter products, and given recommendations by the health authorities. The low utilization is related to, among other things, the fact that they are deliberately made unattractive in order to avoid misuse and that they give a much lower dose of nicotine than cigarettes. The first generation of nicotine chewing gum was made with an unpleasant taste in order for it to be authorized for sale but is now on the market with flavors of mint, fruit, or liquorice.

With regard to snus, its effect on quitting smoking is not advertised and is unknown to the public (Scientific Committee on Emerging and Newly Identified Health Risks [SCENIHR], 2008), the health authorities advise against its use, the perception of health risks are exaggerated in the population (Overland,

Hetland, & Aarø, 2008), and the price is only a bit lower than the price of cigarettes. Some of the reasons why snus still has greater potential for use than medicinal nicotine products are that the nicotine dose is almost the same as for cigarettes (Hatsukami, Ebbert, Feuer, Stepanov, & Hecht, 2007) and that the choice of brand, aesthetic rituals of use, and visibility can represent social positioning and self presentation (Nordby & Wood 2008). Use of snus can thus—in contrast to nicotine chewing gum and nicotine patches—have functions that are identical to those offered by cigarettes. In addition, snus, similar to cigarettes, tastes of tobacco and thus has a sensory effect that medicinal nicotine products perhaps lack. This suggests that snus is the only nicotine product on the Norwegian market that can compete in popularity with cigarettes (Lund, 2009a). The likeability of snus implies that the impact on smoking cessation at the population level (*effectiveness*) will be higher than medicinal nicotine products. This would be the case even if, hypothetically, future RCTs should moderate our results in finding that use of snus results in no increase in rates of abstinence (*efficacy*).

The higher rates of snus use among those using snus on their last quit attempt may be an indication that use of snus when quitting smoking contributes to maintaining dependence on nicotine and that the method can result in dual use for those whose attempt to quit has been unsuccessful. Against this background, advice against using snus as a method for quitting smoking as a general strategy seems to be sensible. However, the method could be particularly relevant for intransigent smokers who are seriously addicted to nicotine and who have been unsuccessful in quitting using conventional methods. For these people, as for all other smokers, nicotine uptake from snus instead of from cigarettes has the potential for reducing harm by at least 90% (Levy et al., 2004). It should also be emphasized that a substantial fraction (37.6%) of those using snus as a method for quitting in fact ended up tobacco free, as also observed in Sweden (Ramström & Foulds, 2006).

A possible negative consequence of allowing use of snus as a method for quitting among inveterate smokers is that the method would not only be used by these highly nicotine-dependent smokers. A partial approval of snus as a potential quit smoking method might result in many smokers, who otherwise would have been able to quit using tobacco completely, would be recruited into prolonged nicotine dependence from snus. In this connection, a relevant challenge for further research is to find out whether transition from cigarettes to snus will increase or decrease the risk of future relapse to smoking as compared with nonsmokers.



## Why is snus more effective than medicinal nicotine products?

Of 100 people who try to quit smoking, about 95 will relapse within 6 months without using medicinal nicotine products. At best, only five more people will quit smoking completely by using medicinal nicotine products (Hughes, Shiffman, Callas, & Zhang, 2003). It has been calculated that availability of nonprescription medicinal nicotine products has had no measurable effect on the quit rate for smoking in the United States (Cummings & Hyland, 2005). This is primarily because so few smokers use these products but also because the effect of medicinal nicotine products is quite low when measured after 12 months (Stead, Perera, Bullen, Mant, & Lancaster, 2008) and is even lower later (Etter & Stapleton, 2006). So snus does not need to have a very great effect on the quit rate in order to produce better results than medicinal nicotine products. Studies have shown that varenicline (Champix) has a much better effect than medicinal nicotine products (Aubin et al., 2008)—which our study has also shown—but this product is only available on prescription, is relatively new and not widely used, and will thus not have a great effect on the quit rate at the population level unless there is a great increase in demand.

We must assume that the most important reason why snus is reported to be more effective for quitting smoking than medicinal nicotine products is that it provides a high enough dose of nicotine so that it feels satisfying for smokers (Hatsukami et al., 2007).

Since snus contains carcinogenic substances and increases the risk of cancer of the esophagus and the pancreas—though lower than for smoking (SCENIHR, 2008)—there would be ethical objections to carrying out an RCT. An alternative design would be to divide people who call the quitline according to method for quitting smoking, to measure other variables that have significance for quitting smoking at the baseline, and then to follow up these people prospectively, as has been done in Sweden (Helgason et al., 2004).

The study indicates that use of varenicline and snus increases the probability of a positive outcome of an attempt to quit smoking compared with medicinal nicotine products. This is the case despite the fact that users of medicinal nicotine products have a greater tendency than snus users to use other additional methods that have a positive effect on quitting smoking. Further studies should be carried out with a design that can provide better evidence. Prolonged use of snus was also widespread among smokers who made unsuccessful attempts to quit smoking. As a method for quitting smoking, snus should only be considered for seriously nicotine-dependent smokers who have previously been unsuccessful with other methods.

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## Declaration of Interests

None declared.

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