

# Nicotine replacement therapy, professional therapy, snuff use and tobacco smoking: a study of smoking cessation strategies in southern Sweden

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*Tobacco Control* 2007;16:410–416. doi: 10.1136/tc.2006.019539

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Received 5 December 2006  
Accepted 7 September 2007

**Objectives:** The strategies used to support smoking cessation among quitters were investigated according to year of smoking cessation and sociodemographic characteristics.

**Methods:** The 2004 public health survey in Skåne, Sweden, is a cross-sectional study. A total of 27 757 people aged 18–80 answered a postal questionnaire. The participation rate was 59%. Different strategies to support smoking cessation—that is, no therapy, nicotine replacement (NRT), professional therapy and snus (snuff) use, were investigated among quitters according to year of smoking cessation, and demographic and socioeconomic characteristics.

**Results:** 14.9% of the men and 18.1% of the women were daily smokers. The prevalence of daily snus use was 19.5% among men but only 2.3% among women. Stratifying the data according to year of smoking cessation (1938–2004) revealed a significant increase in active smoking cessation strategies such as NRT, professional therapy and snus use. NRT was more common among women (23.6%) than men (14.8%) among smokers who quit in 2000–4, but snus use was more common among men (30.4% versus 8.7%). No replacement or other therapy at all was significantly more common among women (63.6%) than men (52.1%). People aged 35–80 years used more nicotine replacement than people aged 18–34, while men aged 18–34 used snus to quit smoking significantly more than men aged 55–80.

**Conclusions:** Snus is used commonly among men as a support for smoking cessation in Sweden. Women use pharmacological NRT to a greater extent, but this can probably not compensate for the much higher extent of snuff use as a cessation strategy among men.

Cigarette smoking has for a long time been a major health concern worldwide.<sup>1,2</sup> The prevalence of smoking has decreased in many developed countries in recent decades.<sup>3</sup> In Sweden the prevalence of smoking has decreased dramatically among men since the 1960s.<sup>4</sup> Among women the prevalence started to decrease later. The prevalence of daily smoking is now higher among women than among men in Sweden.<sup>5</sup> Daily smoking is strongly associated with being middle-aged, being born abroad,<sup>6</sup> and having low socioeconomic status such as, for instance, low education and poor material conditions.<sup>7</sup>

The prevalence of daily smoking depends on factors such as the numbers of people who start smoking, changes in the population denominator, mortality among smokers versus non-smokers and the rate of smoking cessation. Smoking cessation is a complex process that includes social, psychological and biological factors. The biological factors include nicotine dependence.<sup>8</sup> In Sweden, smoking cessation is positively associated with male sex, being born in Sweden and having higher socioeconomic status, such as higher education and more affluent material conditions.<sup>9</sup>

Since the 1980s snus (snuff) or non-smoked tobacco has been suggested as a less harmful alternative for current cigarette smokers. Sweden has become a country of interest in this regard, because Sweden was granted an exemption from the general ban on manufacturing and marketing of snus<sup>10</sup> when joining the European Community in 1995. For this reason, as well as for historical reasons, Sweden has probably the highest prevalence of daily snus or non-smoked tobacco use among men, approximately 20%, in the world.<sup>11</sup> The notion that snus might be a less harmful alternative to tobacco smoking has, however, not remained undisputed.

One problem is that research reports concerning the health effects of snus use are partly conflicting. Snus, in contrast to tobacco smoking, has not been consistently shown to be associated with cancers of the, stomach,<sup>12,13</sup> oesophagus,<sup>13</sup> skin,<sup>14</sup> or head and neck, although moderate positive associations with cancers of the head and neck cannot be ruled out due to lack of power.<sup>15</sup> In contrast, snus is addictive.<sup>16</sup> Furthermore, the association between snus use and cardiovascular diseases remains unclear.<sup>17–19</sup> A second problem is that increased snus use may function both as a form of nicotine replacement which helps smokers to quit and, on the other hand, as a pathway into nicotine dependence and subsequent tobacco smoking for non-smokers. Most studies have reported that snus use was associated with smoking cessation, not initiation.<sup>11,20–28</sup> A few studies from Sweden have even reported a negative association between snus use and smoking initiation.<sup>11,27</sup> In contrast, some US studies have reported an association also between snus and smoking initiation.<sup>29</sup> Still, no randomised clinical trials investigating the utility and risks of snus as a nicotine replacement therapy (NRT) under controlled conditions have been conducted.<sup>27</sup> The present study is an attempt to quantify the extent to which oral snus use as well as pharmacological NRT and professional therapy have been utilised as strategies to quit smoking among male and female former daily smokers in a general adult population in southern Sweden. The study also investigates associations between demographic, socioeconomic and current snus consumption with smoking cessation strategies among recent quitters.

**Abbreviation:** NRT, nicotine replacement therapy

The two aims of this paper are to investigate the strategies used to support smoking cessation among quitters (no therapy, nicotine replacement, professional therapy or snus) according to year of smoking cessation and to investigate associations between demographic, socioeconomic and current snus consumption with smoking cessation strategies among recent quitters.

## METHODS

### Study population

The 2004 public health survey in Skåne is a cross-sectional study based on a random sample of respondents drawn from the official population registers including all people living in Skåne. A total of 27 963 people out of 47 621 included in the random sample of 18–80 year olds answered a postal questionnaire in the autumn (September–December) of 2004, which represents a 59% participation rate. Two reminder letters were also sent to the respondents, and a subsequent phone call was made to the remaining non-respondents. The questionnaire is a general public health questionnaire that is not solely focused on tobacco smoking. The random sample was based on individuals, not households. A total of 27 757 respondents returned complete answers from the right person in the household according to age and sex, but in a few cases a questionnaire sent to a female was answered by a male and vice versa, and a few responses with the wrong birth year also occurred. A total of 6717 respondents who had previously been daily smokers for a time interval of six months or more and who had quit smoking were investigated in this study.

### Dependent variable

The smoking item ("Do you smoke?") includes four options: daily smoker, intermittent (non-daily) smoker, stopped

smoking and never smoked. This study investigated the stopped smoking alternative ( $n = 6717$ ) in relation to two complementary items.

The two complementary items concern (1) what therapy was used to support smoking cessation including the options no support at all (neither nicotine replacement nor any other support/therapy including snus), nicotine replacement, professional therapy and snus use, and (2) year of smoking cessation (answers ranging from 1938 to 2004). This item was categorised into 1938–1979, 1980–1989, 1990–1999 and 2000–2004 (see appendix).

### Independent variables

The item concerning daily snus use included the alternatives "yes" and "no."

Age was divided into the age groups 18–34, 35–44, 45–54, 55–64 and 65–80 years.

All analyses were stratified by sex.

Country of origin: All people born in countries other than Sweden were merged into a single category, which yielded the two categories "Sweden" and "other."

Education was divided by length of education into 9 years or less, 10–12 years and 13 years of education or more.

Economic stress was assessed by the question "How many months during the past year have you had problems with paying your bills?" The item had four answers: "never," "occasionally," "approximately half the months during the year" and "every month."

### Statistics

Prevalences of smoking, daily snus use, demographic, education and economic stress characteristics of the population were calculated (table 1). The prevalences of current daily smokers,

**Table 1** Prevalence (%) of tobacco smoking, daily snus use, demographic and socioeconomic variables (public health survey, Skåne 2004)

	Men (n = 12 626)	Women (n = 15 131)	Total (n = 27 757)
<b>Tobacco smoking</b>			
Daily smoker	14.9	18.1	16.6
Intermittent smoker	4.5	4.7	4.6
Stopped smoking	28.7	21.7	24.9
Never smoked	51.9	55.5	53.9
(Missing)	(282)	(506)	(788)
<b>Daily snus use</b>			
Yes	19.5	2.3	10.2
No	80.5	97.7	89.8
(Missing)	(568)	(735)	(1303)
<b>Age</b>			
18–34	22.9	25.5	24.3
35–44	17.5	18.2	17.9
45–54	18.2	17.6	17.9
55–64	20.6	19.2	19.9
65–80	20.9	19.5	20.1
(Missing)	(0)	(0)	(0)
<b>Country of origin</b>			
Sweden	88.5	88.0	88.2
Other countries	11.5	12.0	11.8
(Missing)	(570)	(477)	(1047)
<b>Education</b>			
13+ years	32.4	39.0	36.0
10–12 years	23.9	23.6	23.7
up to 9 years	43.7	37.4	40.3
(Missing)	(1095)	(1592)	(2687)
<b>Economic stress</b>			
Never	75.9	72.5	74.0
Occasionally	16.9	18.4	17.8
Approximately every second month	3.4	4.4	3.9
Every month	3.8	4.7	4.3
(Missing)	(168)	(219)	(387)

Total number = 27 757.

**Table 2** Prevalence (%) (SE) of current daily smokers, current intermittent smokers, former smokers (stopped smoking) and never smokers

	Daily smokers	Intermittent smokers	Former smokers (stopped)	Never smokers	Total (100.0%)
<b>Men (n = 12 626)</b>					
Age					
18–34	10.9 (0.6)	7.9 (0.5)	12.0 (0.6)	69.2 (0.9)	(2847)
35–44	14.4 (0.8)	5.1 (0.5)	17.2 (0.8)	63.2 (1.0)	(2171)
45–54	19.6 (0.8)	4.8 (0.5)	30.1 (1.0)	45.5 (1.1)	(2271)
55–64	18.8 (0.8)	3.0 (0.3)	38.7 (1.0)	39.6 (1.0)	(2556)
65–80	11.7 (0.6)	1.6 (0.2)	46.2 (1.0)	40.5 (0.9)	(2496)
(Missing)					(282)
Country of origin					
Sweden	13.1 (0.3)	4.4 (0.2)	29.0 (0.4)	53.5 (0.5)	(10,413)
Other countries	26.8 (1.2)	5.4 (0.6)	26.4 (1.2)	41.4 (1.3)	(1337)
(Missing)					(873)
Education					
13+ years	8.1 (0.5)	4.6 (0.3)	25.7 (0.7)	61.6 (0.8)	(3672)
10–12 years	15.7 (0.7)	5.8 (0.4)	22.7 (0.8)	55.8 (1.0)	(2702)
Up to 9 years	19.6 (0.6)	3.8 (0.3)	33.0 (0.7)	43.6 (0.7)	(4863)
(Missing)					(1386)
Economic stress					
Never	11.8 (0.3)	3.7 (0.2)	30.5 (0.5)	53.9 (0.5)	(9209)
Occasionally	21.2 (0.9)	6.4 (0.5)	23.3 (0.9)	49.0 (1.1)	(2048)
Approximately every second month	29.1 (2.2)	8.0 (1.3)	22.6 (2.1)	40.3 (2.4)	(412)
Every month	36.6 (2.2)	6.8 (1.2)	21.4 (1.9)	35.2 (2.2)	(457)
(Missing)					(497)
Daily snuff use					
No	15.6 (0.4)	3.4 (0.2)	26.1 (0.4)	54.9 (0.5)	(9543)
Yes	10.5 (0.6)	9.0 (0.6)	40.0 (1.0)	40.5 (1.0)	(2312)
(Missing)					(768)
<b>Women (n = 15 131)</b>					
Age					
18–34	16.2 (0.6)	7.9 (0.4)	11.5 (0.5)	64.4 (0.8)	(3813)
35–44	18.3 (0.7)	5.2 (0.4)	18.5 (0.8)	58.0 (1.0)	(2703)
45–54	24.7 (0.8)	4.4 (0.4)	28.3 (0.9)	42.7 (1.0)	(2611)
55–64	20.3 (0.8)	3.5 (0.3)	29.7 (0.9)	46.4 (0.9)	(2820)
65–80	11.6 (0.6)	1.5 (0.2)	24.5 (0.8)	62.3 (0.9)	(2681)
(Missing)					(503)
Country of origin					
Sweden	17.4 (0.3)	4.7 (0.2)	22.2 (0.4)	55.7 (0.4)	(12,437)
Other countries	20.7 (1.0)	5.3 (0.2)	17.1 (0.9)	56.9 (1.2)	(1693)
(Missing)					(1001)
Education					
13+ years	10.4 (0.4)	5.3 (0.3)	22.1 (0.6)	62.2 (0.7)	(5159)
10–12 years	20.2 (0.7)	6.0 (0.4)	19.4 (0.7)	54.4 (0.9)	(3116)
Up to 9 years	24.2 (0.6)	3.5 (0.3)	22.3 (0.6)	50.0 (0.7)	(4793)
(Missing)					(2063)
Economic stress					
Never	14.4 (0.3)	4.3 (0.2)	22.7 (0.4)	58.6 (0.5)	(10,375)
Occasionally	22.7 (0.8)	5.8 (0.5)	19.2 (0.8)	52.3 (1.0)	(2666)
Approximately every second month	33.5 (1.9)	8.8 (1.1)	19.1 (1.6)	38.6 (1.9)	(639)
Every month	39.0 (1.9)	5.1 (0.8)	20.2 (1.5)	35.7 (1.8)	(681)
(Missing)					(769)
Daily snuff use					
No	17.7 (0.3)	4.6 (0.2)	21.0 (0.4)	56.7 (0.4)	(13,726)
Yes	10.8 (1.7)	11.7 (1.7)	53.4 (2.8)	24.1 (2.4)	(324)
(Missing)					(1081)

Total number = 27 757.

current intermittent smokers, former smokers and never smokers were calculated with standard errors in parentheses (table 2). The proportions of different strategies to support smoking cessation were investigated among quitters according to year of smoking cessation with standard errors in parentheses (table 3). The distributions (%) and odds ratios with 95% confidence intervals of NRT and snus use when quitting smoking were calculated according to demographic and socio-economic characteristics in logistic regression models with adjustment for age (with the exception of the calculation of age itself). In the first panel, the outcome was having used NRT versus having used either no help at all, snus or professional help. In the second panel, the outcome was having used snus versus having used either no help at all, NRT or professional help. These analyses were stratified by sex and adjusted for age

(table 4). The statistical analysis was performed using the SPSS software package.<sup>30</sup>

## RESULTS

Table 1 shows that the prevalence of daily smoking was 14.9% among men and 18.1% among women. In contrast, the prevalence of male ever smokers who had stopped smoking was 28.7%, but the corresponding prevalence among women was only 21.7%. The proportion of daily snus users was 19.5% among men but only 2.3% among women. The proportion born in countries other than Sweden was 11.5% among men and 12.0% among women. The proportion with high education was 32.4% among men and 39.0% among women, and the proportion with 9 years of education or less was correspondingly somewhat lower among women. The proportion who

**Table 3** Distribution (%) (SE) of quitters using no nicotine replacement or other therapy, nicotine replacement therapy (NRT), professional therapy and snus when quitting smoking according to year of smoking cessation

	No replacement or other therapy	NRT	Professional therapy	Snus use	Total
<b>Men (n = 3542)</b>					
Year of smoking cessation					
1938–79	85.6 (1.1)	1.6 (0.4)	0.6 (0.3)	12.2 (1.1)	100.0 (949)
1980–9	69.5 (1.6)	5.7 (0.9)	0.5 (0.3)	24.3 (1.6)	100.0 (787)
1990–9	55.2 (1.6)	13.9 (1.1)	0.9 (0.3)	29.8 (1.5)	100.0 (962)
2000–4	52.1 (2.1)	14.8 (1.5)	2.7 (0.7)	30.4 (1.9)	100.0 (560)
(Missing)					(284)
<b>Women (n = 3175)</b>					
Year of smoking cessation					
1938–79	97.3 (0.7)	0.5 (0.3)	1.0 (0.4)	1.2 (0.4)	100.0 (586)
1980–9	86.6 (1.3)	9.8 (1.2)	1.6 (0.5)	2.0 (0.5)	100.0 (642)
1990–9	71.1 (1.4)	21.9 (1.3)	1.6 (0.4)	8.3 (0.9)	100.0 (982)
2000–4	63.6 (1.8)	23.6 (1.6)	4.1 (0.7)	8.7 (1.0)	100.0 (715)
(Missing)					(250)

Total number = 6717.

never experienced difficulties paying their bills was 75.9% among men and 72.5% among women.

Table 2 shows that the prevalences of daily smoking were highest in the age group 45–54 years among both men and women. The prevalences of quitters were lowest in the 18–34-year age group among both men and women. The prevalences of never smoked were highest in the age group 18–34 years among men, but in both the 18–34 and 65–80-year age groups among women. Both male and female respondents with low education, economic stress and no current daily snus use were daily smokers to a significantly higher extent and quitters to a significantly lower extent than respondents with high education, no economic stress and current daily snus use. Both male and female respondents born in other countries than Sweden were daily smokers to a significantly higher extent than respondents born in Sweden, but only females born in other countries had stopped smoking to a significantly lower extent.

Table 3 shows the distribution of smoking cessation strategies among quitters according to year of smoking cessation. The proportion of quitters who used nicotine replacement, professional therapy as well as snus when quitting has increased among both men and women. The proportion of male quitters who used NRT increased from 1.6% of all quitters who quit smoking in 1938–1979 to 14.8% of all quitters who stopped smoking in 2000–2004. The corresponding numbers among women were 0.5% and 23.6%, respectively. The first quitters in this study material who used NRT stopped smoking in 1971 and 1972 (nine respondents). The proportion of male quitters who used snus when quitting increased from 12.2% of all quitters who quit smoking in 1938–1979 to 30.4% of all quitters who stopped smoking in 2000–2004. The corresponding numbers among women were 1.2% and 8.7%, respectively. On the other hand, the proportion of quitters who used no NRT and no other therapy had decreased from 85.6% to 52.1% among male quitters, and from 97.3% to 63.6% among female quitters between 1938–1979 and 2000–2004. The proportion of quitters using professional therapy when quitting was still small among men and women but seems to have been growing. All changes (according to year of smoking cessation) are statistically significant.

Table 4 shows that NRT was significantly more common among middle-aged and older men and women than the young (18–34 years) among quitters who had stopped smoking in 2000–2004. In the age group 45–54 years the odds ratios with 95% confidence intervals of having used NRT when quitting were 5.27 (2.42 to 11.5) among men and 3.69 (2.16 to 6.29) among women compared to men and women aged 18–34 years,

respectively. No statistically significant differences in NRT were observed according to country of origin, education and economic stress. Quitters who had stopped smoking in 2000–2004 with the support of NRT had significantly decreased odds ratios of being current daily snus users in 2004. Young men aged 18–34 years who were former daily smokers had significantly higher odds of having used snus when quitting than older men aged 55–64 and 65–80 years. Men born in other countries than Sweden who had quit smoking in 2000–2004 had significantly lower odds ratios of having used snus when quitting than men born in Sweden. No such significant associations were observed for women. No statistically significant differences in snus use when quitting were observed according to education and economic stress. Quitters who had stopped smoking in 2000–2004 with the support of snus had significantly increased odds ratios of being current daily snus users in 2004.

## DISCUSSION

This study shows that the prevalence of daily snus use was 19.5% among men but only 2.3% among women. Stratifying the data according to year of smoking cessation (1938–2004) revealed a significant increase in active smoking cessation strategies/support such as nicotine replacement, professional therapy and snus use among both men and women. Pharmacological NRT was significantly more common among women (23.6%) than men (14.8%) among those smokers who quit in 2000–2004, but snus use as a strategy to quit was more common among men (30.4%) than women (8.7%). No therapy at all when quitting was significantly more common among women (63.6%) than men (52.1%). Middle-aged and older people used more nicotine replacement, while young men used snus to quit smoking significantly more than older men.

The decline in tobacco smoking prevalence is a function of initiation rates, cessation rates, death rates among smokers and changes in the population denominator due to immigration if immigrants have a different smoking prevalence than the native population. Snus use may have a benevolent and supportive effect in relation to tobacco smoking cessation, but possibly also an adverse and addictive effect in relation to smoking initiation. This study has only been designed to answer questions concerning the supportive effect in relation to smoking cessation. There is no possibility of answering research questions concerning the addictive effects of snus use and subsequent tobacco smoking in this study design. The public health survey questionnaire did not include any items on snus and its effects on smoking initiation.



**Table 4** Prevalence (%) and odds ratios (ORs) with 95% confidence intervals (95% CIs) of using NRT and snus when quitting smoking among all quitters 2000–4 according to age, country of origin and education (country of origin, education, economic stress and daily snus use have been age adjusted in logistic regression model)

	Men (n = 560)		Women (n = 715)	
	% (n = 560)	OR (95% CI)	% (n = 715)	OR (95% CI)
<b>NRT</b>				
<i>Age</i>				
18–34 years	6.1 (164)	1.00	12.2 (230)	1.00
35–44 years	13.7 (94)	2.44 (1.03 to 5.81)	29.5 (132)	3.03 (1.76 to 5.21)
45–54 years	25.5 (102)	5.27 (2.42 to 11.5)	33.8 (133)	3.69 (2.16 to 6.29)
55–64 years	19.1 (116)	3.64 (1.65 to 8.03)	27.3 (132)	2.71 (1.56 to 4.69)
65–80 years	14.3 (84)	2.57 (1.06 to 6.22)	23.9 (88)	2.26 (1.20 to 4.24)
(Missing)	(0)		(0)	
<i>Country of origin</i>				
Sweden	14.9 (456)	1.00	24.3 (609)	1.00
Other country	16.7 (79)	1.24 (0.64 to 2.39)	18.8 (84)	0.72 (0.40 to 1.27)
(Missing)	(25)		(22)	
<i>Education</i>				
13+ years	14.4 (139)	1.00	20.9 (240)	1.00
10–12 years	12.0 (126)	0.91 (0.44 to 1.88)	25.4 (169)	1.32 (0.83 to 2.12)
Up to 9 years	15.9 (238)	1.05 (0.58 to 1.91)	27.3 (216)	1.22 (0.78 to 1.92)
(Missing)	(57)		(90)	
<i>Economic stress</i>				
Never	16.2 (390)	1.00	24.8 (465)	1.00
Occasionally	13.6 (103)	0.95 (0.50 to 1.81)	22.1 (156)	0.86 (0.56 to 1.32)
Approximately every second month	7.7 (26)	0.53 (0.12 to 2.32)	14.9 (47)	0.64 (0.28 to 1.49)
Every month	6.2 (32)	0.41 (0.10 to 1.79)	28.2 (39)	1.34 (0.64 to 2.82)
(Missing)	(9)		(8)	
<i>Current daily snus use</i>				
No	21.2 (327)	1.00	24.8 (629)	1.00
Yes	5.7 (210)	0.24 (0.13 to 0.46)	12.5 (64)	0.44 (0.21 to 0.94)
(Missing)	(23)		(22)	
<b>Snus use</b>				
<i>Age</i>				
18–34 years	37.8 (164)	1.00	8.7 (230)	1.00
35–44 years	35.8 (94)	0.92 (0.54 to 1.55)	12.1 (132)	1.45 (0.72 to 2.90)
45–54 years	26.5 (102)	0.59 (0.34 to 1.02)	11.7 (133)	1.04 (0.49 to 2.20)
55–64 years	25.2 (116)	0.56 (0.33 to 0.94)	9.1 (132)	1.05 (0.50 to 2.22)
65–80 years	21.4 (84)	0.45 (0.24 to 0.82)	2.3 (88)	0.24 (0.06 to 1.07)
(Missing)	(0)		(0)	
<i>Country of origin</i>				
Sweden	33.5 (456)	1.00	9.4 (609)	1.00
Other country	14.1 (79)	0.30 (0.15 to 0.59)	4.7 (84)	0.48 (0.17 to 1.36)
(Missing)	(25)		(22)	
<i>Education</i>				
13+ years	27.3 (139)	1.00	9.2 (240)	1.00
10–12 years	24.0 (126)	0.74 (0.42 to 1.29)	7.7 (169)	0.89 (0.46 to 1.72)
Up to 9 years	23.6 (238)	1.48 (0.92 to 2.37)	9.3 (216)	0.71 (0.33 to 1.53)
(Missing)	(57)		(90)	
<i>Economic stress</i>				
Never	28.5 (390)	1.00	7.5 (465)	1.00
Occasionally	35.0 (103)	1.17 (0.73 to 1.87)	6.5 (156)	0.77 (0.39 to 1.62)
Approximately every second month	38.5 (26)	1.31 (0.57 to 3.01)	21.3 (47)	2.99 (1.35 to 6.65)
Every month	34.4 (32)	1.11 (0.51 to 2.41)	15.4 (39)	2.09 (0.81 to 5.37)
(Missing)	(9)		(8)	
<i>Current daily snus use</i>				
No	3.4 (327)	1.00	1.3 (629)	1.00
Yes	73.0 (210)	76.43 (38.76 to 150.69)	82.8 (64)	439.52 (157.47 to 1226.81)
(Missing)	(9)		(22)	

Total number = 1275.

The prevalence of daily smoking in this cross-sectional public health survey in 2004 is significantly lower ( $p < 0.001$ , not shown in tables) for both men and women compared to a cross-sectional public health survey conducted on the population in Skåne in 1999–2000 using exactly the same random sampling method and study design. The prevalence among men decreased from 18.2% to 14.9% (–3.3% units). The prevalence among women decreased from 20.3% to 18.1% (–2.2% units).<sup>31</sup> The decrease among men is more pronounced than among women. Furthermore, 30.4% of the men who quit smoking in 2000–2004 did it in connection with snus use. These two observations may support the conclusion that the higher

prevalence of snus use among men may constitute a part of the explanation why men have quit smoking at a significantly higher rate than women in southern Sweden,<sup>9</sup> although this can not be inferred from a cross-sectional study. The present study suggests that the importance of snus consumption seems to have increased over the past decades. The use of NRT seems to be more common as a support to quit smoking among women.

The results of this study demonstrate a similar prevalence of snus use among men as other studies from Sweden (see, for example, Bolinder *et al*<sup>17</sup>). The results are also similar to a previous study in Sweden which has shown that approximately

### What this paper adds

- Snus (snuff) is used very commonly as a support in connection with smoking cessation in Sweden, particularly among men. Women use pharmacological nicotine replacement therapy to a greater extent than men in connection with cessation, but this can probably not compensate for the much higher snus use as a support in smoking cessation among men.

54% of all nicotine comes from smoked sources, 45% from non-smoked tobacco and 1.3% from nicotine replacement products. For men, 63% of the nicotine consumed comes from non-smoked tobacco.<sup>32</sup> This finding corresponds rather well with the observation in the present study that the prevalence of daily smoking is 14.9% but the prevalence of daily snus use is 19.5% among men.

Nicotine replacement therapy as a support in smoking cessation seems to be significantly more common among middle-aged and older men and women than among the young in the part of the population that had quit smoking during 2000–2004. In contrast, snus use as a support in smoking cessation seems to be significantly more common among young men. Men born in Sweden used snus in connection with smoking cessation to a significantly higher extent than men born abroad. There were no significant socioeconomic differences in having used either NRT or snus in connection with smoking cessation. The results also suggest that men and women who used snus as a support in connection with smoking cessation when quitting continued to use snus daily to a very great extent (73.0% among men and 82.8% among women). This may be regarded as a potential health problem, considering the fact that the health effects of daily snus use are not undisputed and partly remain to be investigated.

The fact that a substantial proportion of quitters in Sweden use snus as a support in quitting ought to have consequences for health policy and prevention. However, these consequences still remain largely unclear. Furberg *et al*<sup>27</sup> have suggested that randomised clinical trials are needed to investigate the utility as well as the risks of using snus as a form of NRT under controlled conditions.

Although not statistically significant, snus use seems to have been an important aid in smoking cessation among men with economic stress, while, on the other hand, NRT was more common among men who experienced no economic stress. It seems that snus may provide an aid for smoking cessation in groups that would otherwise be less likely to use conventional methods.

The socioeconomic status variable measured as occupational status might also have been included in the analyses. However, this variable is not unproblematic. Many adults aged 18–65 years do not have an occupation. Approximately half of the population in Skåne in this age group is composed of housewives, disability pensioners, unemployed people and students. Furthermore, for the part of the population that has an occupation the correlation with level of education is high in southern Sweden (approximately Pearson's  $r = 0.7$ ).<sup>33</sup>

### Strengths and limitations

The 59% participation rate may be acceptable considering the response rates currently obtained in questionnaires. The age,

sex and education distributions correspond well with the corresponding distributions in the official population registers. In contrast, the group born in countries other than Sweden is clearly under-represented in this study. Still, the risk of selection bias was considered low in a previous study on a random sample conducted with almost exactly the same sampling design and participation rate (59%) in Skåne in 2000.<sup>34</sup> The same results have been obtained from internationally unpublished analyses conducted on the 2004 Skåne data used in this study. The risk of selection bias may thus be regarded as low in this study also. Furthermore, weighting by sociodemographic factors such as age, sex and education in table 1 for differences between respondents and non-respondents will yield the same prevalence of daily smoking and other characteristics as those already presented. In contrast, people born in other countries than Sweden are also under-represented in the 2004 survey. This has implications for the estimation of the prevalence of daily smoking among men but not women in this study, because men born in other countries than Sweden have a higher prevalence of daily smoking than men born in Sweden. The corresponding differences among women are very small. No difference in the prevalence of intermittent smoking has been observed between people born in other countries than Sweden as opposed to people born in Sweden.<sup>6</sup> A calculation of the effect on the prevalence of daily smoking of the under-representation of people born in other countries than Sweden suggests that the prevalence of daily smoking is underestimated by 0.7 percentage units among men and by less than 0.1 percentage units among women. The same patterns of underestimation of the prevalence of daily smoking are also present in the 2000 Skåne survey.

The validity of items assessing smoking has previously been analysed several times. The results have consistently shown that self-reported tobacco smoking is a valid and reliable instrument for the measurement of tobacco smoking habits in a population.<sup>35–37</sup> Year of smoking cessation has probably not been misclassified to any important extent, although problems connected with giving the correct single year may occur, because the categorisation into the broad categories 1938–1979, 1980–1989, 1990–1999 and 2000–2004 substantially decreases the risk of misclassification. The test-retest stability and validity of snus items have been reported to be good.<sup>38</sup>

Sex might be a confounder of the association between the smoking cessation strategy items and year of smoking cessation as well between the demographic and socioeconomic items and the smoking cessation strategy items. Stratification for sex was therefore conducted in tables 1–4. Age might be a confounder between the demographic and socioeconomic items, and the smoking cessation strategy items. Adjustments for age (by the calculation of odds ratios with 95% confidence intervals in logistic regression models) were therefore conducted in table 4. The associations between the smoking cessation strategy items and year of smoking cessation were not age adjusted for the obvious reason of the correlation between the age of the respondents and the time trend in the year of smoking cessation variable.

The cross-sectional study design is a weakness in all cross-sectional studies owing to the lack of possibility to draw conclusions concerning direction of causality. However, the associations between the smoking cessation strategy items and year of smoking cessation in table 3 are merely descriptive and do not infer causality. Furthermore, the associations between the demographic and socioeconomic items and the smoking cessation strategy items in table 4 would most probably predominantly go in the direction from demographic and

socioeconomic characteristics to the smoking cessation strategies.

## CONCLUSION

Nicotine replacement therapy and snus represent important strategies to support smoking cessation in Sweden. They seem to have increased substantially in importance over several decades (1938–2004). Women use pharmacological NRT to a greater extent, but this can probably not compensate for the much higher snus use among men.

## ACKNOWLEDGEMENTS

This study was supported by the ALF Government Grant M:B 39 921/2006, Sweden.

Competing interests: none.

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## APPENDIX

Tobacco smoking items:

Q1a. “Do you smoke?”:

- (1) “Yes, daily”
- (2) “Yes, but not every day”
- (3) “No”

If the answer is (2) or (3), then go to question 2.

Q1b. If “Yes, daily”: “How much do you smoke on average?”:

- Cigarettes/day
- Cigarillos/day
- Cigars/day
- Grams pipe tobacco/week

Q2a. “Have you previously smoked daily during at least six months?”

- “No”
- “Yes”

Q2b. “How long ago did you quit smoking daily?”:

- “Less than half a year ago”
- “Between 6 and 12 months ago”
- “More than one year ago”

Q2c (If the answer was yes to Q2a) “How did you stop smoking?”:

- “On my own without nicotine replacement therapy”
- “On my own with nicotine replacement therapy”
- “Got professional help”
- “Started to use snus instead”

“State the year you quit smoking” (possible to answer any year)

Q3 “Do you use snus daily?”

- “No”
- “Yes”