Role of *snus* (oral moist snuff) in smoking cessation and smoking reduction in Sweden

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ABSTRACT

Aims To assess to what extent *snus* has been used as an aid to stop smoking among Swedish smokers.
Design A random telephone retrospective survey of Swedish smokers and ex-smokers.
Setting Survey conducted in November–December 2000.
Participants A national sample of 1000 former and 985 current daily smokers aged 25–55 years.
Measurements Smoking status, date and method of quitting by self-report.
Findings Thirty-three per cent of former smokers and 27% of current smokers had ever used *snus*. The difference was larger among men (55% versus 45%, $P = 0.003$). Current smokers who made use of *snus* smoked on average fewer cigarettes per day than non-users of *snus*. The mean duration of abstinence among former smokers was not influenced by *snus* use. Conditionally on age, education and use of nicotine replacement therapy there was an increased probability of being a former rather than a current smoker with ever use (OR 1.72, 95% CI = 1.30–2.28) or current use (OR 1.81, 95% CI = 1.31–2.53) of *snus*. Having used *snus* at the latest quit attempt increased the probability of being abstinent by about 50% (OR 1.54, 95% CI = 1.09–2.20).
Conclusions Our study suggests that by using *snus*, Swedish male smokers may increase their overall chances of abstinence. However, 71% of the men in this sample who quit smoking did so without using *snus* and the duration of abstinence was not affected by *snus* use. This suggests that *snus* is not a necessary component of smoking cessation at the population level. *Snus* use was very rare among women.

KEYWORDS Abstinence, gender, oral moist snuff, smoking cessation, smoking reduction, *snus.*

INTRODUCTION

Long-term cigarette smoking is a threat to human health. Among smokers, nicotine addiction and psychological factors are potent behaviour maintaining forces, beyond any rational consideration and even the desire to quit (APA 1994). In fact, the proportion of long-term abstinent smokers is still limited in most clinical settings and many smokers find it impossible to stop completely (Piasecki & Baker 2001). This has raised an interest in strategies of harm reduction which has been defined as: 'A product is harm-reducing if it lowers total tobacco-related mortality and morbidity even though use of that product may involve continued exposure to tobacco-related toxicants' (Stratton *et al.* 2001). It has been argued that the amount of risk reduction either might not be quantifiable or, in the absence of a proxy outcome, would require a very large study (thousands of subjects) and at least 8 years from inception to results (Hughes 2000). The discussion on harm reduction has evolved further

(Kozlowski *et al.* 2001; Stratton *et al.* 2001) and it has been concluded that more research is needed to establish whether modified cigarettes, *snus* or other nicotine-containing products can improve public health.

Modifications to cigarettes, such as adding filters and introducing brands with less tar and nicotine, has not been shown to reduce harm (Stratton *et al.* 2001). Because most tobacco-related harm is caused by inhaled components of tobacco smoke, unburned tobacco products are considered relatively safer. An intuitive approach to harm reduction would therefore be to substitute inhaled nicotine with nicotine from other sources. Nicotine replacement therapy (NRT) involves a highly regulated pharmaceutical product, which can secure a stable reduction of the amount smoked among some regular smokers (Bolliger 2000). Little is known about the harm-reducing potential of the unregulated products, such as the many varieties of chewing tobacco, *snus*, snuff, etc.

A real-life long-term test of the concept of harm reduction has been ongoing in Sweden with little or no scientific monitoring (Henningfield & Fagerström 2001). *Snus* (oral moist snuff) has been produced in Sweden since the early 19th century. It was exclusive to Sweden and emerged as the preferred tobacco product for working-class men. During the 20th century cigarette smoking grew in popularity, and *snus* use declined. As a consequence, the dominant manufacturer considered terminating production. From the early 1970s, however, Swedish Match targeted young males and athletes as a new group of *snus* consumers and marketed the product intensively. Since then the sales have increased and *snus* is now used daily by about 20% of Swedish adult males, across all social groups. The levels of consumption are typically high (on average, $^1/_2$–1 box a day). This is equivalent to the nicotine content of 35–75 cigarettes per day with high and sustained levels of blood nicotine (Holm *et al.* 1992). Due to the lack of consistent associations with major diseases, *snus* is considered to be less harmful than cigarettes (Huhtasaari *et al.* 1992; Bolinder *et al.* 1994; Lewin *et al.* 1998; Schildt *et al.* 1998; Huhtasaari *et al.* 1999; Ye *et al.* 1999; Lagergren *et al.* 2000), and few users seek help for their addiction. Furthermore, *snus* is less expensive than cigarettes and an average user will spend about half of the 36 SEK (3.50 USD) paid for a pack of cigarettes on a box of *snus*.

Sweden was the only industrialized country in the world to reach the goal set by WHO for the year 2000 of less than 20% adult smokers (Statistics Sweden 2001). It has been suggested that this low prevalence has been achieved through the widespread use of *snus* by Swedish men, but very little evidence has been presented to substantiate this assumption (Henningfield & Fagerstrom 2001; Ramstrom 2000).

Because of this historical background Sweden appears to be a natural setting to address questions on harm reduction at the population level (Henningfield & Fagerstrom 2001). If *snus* use would indeed be associated with an increase in smoking quit rates and/or with a reduction of smoking among current smokers, this would lend further strength to the suggested role of *snus* in a strategy of 'harm reduction'. In the present study, we analysed the reports of *snus* use in a national sample of current and former daily smokers.

METHODS

On behalf of the Swedish Cancer Society and Pharmacia Inc., a telephone survey was conducted between 20 November and 17 December 2000 in order to recruit two equal-sized national samples of at least 1000 former and current smokers. All residents in Sweden between the age of 25 and 55 years, who currently smoked tobacco daily, or had done so in the past, were eligible for an in-depth interview. The latter aimed to describe social and behavioural characteristics of the two groups, with the purpose of identifying cues for prevention campaigns. In total 7883 individuals were screened, of whom 2715 fulfilled the criteria for inclusion. A total of 2002 individuals (1000 former and 1002 current smokers) were interviewed successfully, corresponding to 74% of the eligible sample. Reasons for non-participation among the 713 subjects who were not interviewed were: poor health (2.7%), non-Swedish speaking (10.3%) and refusal (87.0%).

Current smokers in the survey were defined as subjects either smoking at least one cigarette/other tobacco product a day, or smoking on at least seven occasions per week and using oral snuff. This analysis is based on 985 daily smokers. Former smokers ($n = 1000$) were defined as subjects having smoked daily for at least 6 months in their lives and having been continuously abstinent for at least 4 weeks by the time of the interview. Exclusive users of *snus* were identified, but not interviewed.

A structured interview was conducted, encompassing slightly different questions in the two groups. Smokers were interviewed about their consumption of cigarettes and/or other smoked tobacco, previous attempts to quit smoking, intention to quit in the future, motivations to quit, opinions on cigarettes price, past and current use of *snus* and of NRT and corresponding motivations for initial and continued use.

Former smokers were asked about previous quit attempts and duration of the present period of abstinence, but not on previous smoking behaviour. Use of *snus* and NRT was also investigated, with the same set of questions as for current smokers. Both groups were asked to rate

the support received from different sources (e.g. social network, health professionals) during their previous or current abstinence periods, as well as their degree of agreement with tobacco regulation and policy.

Statistical analysis

In univariate analyses of categorical variables we compared the proportion using *snus* (ever, current and last quit attempt use), as well as other relevant characteristics among current and former smokers. The χ^2 statistic was used to examine the departure of the observed distribution from that expected under the null hypothesis, with 5% level for statistical significance ($P < 0.05$). The means of continuous numerical variables were compared between two groups assuming a normal distribution (Student's *t*-test). When comparing the means of continuous variables in subgroups defined by several explanatory factors we used the multiple factors analysis of variance (ANOVA) for unbalanced design (Kleinbaum & Kupper 1978). Multiple regression analyses were also conducted to study the association between *snus* use and the odds of being a former, rather than a current smoker, conditionally on other potential confounding factors. As the study dealt with a dichotomous outcome variable, we derived the association estimates (odds ratios, OR) and their corresponding confidence limits (95% CI) by means of logistic regression based on maximum likelihood equations (Breslow & Day 1980).

RESULTS

The study population

Among 1002 current smokers, 985 (98.3%) were daily smokers. Of these, 927 (94%) smoked cigarettes exclusively, while virtually all the remaining 6% smoked cigarettes as well as other products (three subjects did not provide information on type of tobacco).

There were some significant socio-demographic differences between former and current smokers (Table 1). Former smokers were on average older, better educated and with higher income than current smokers. In addition, more former than current smokers lived in stable relations (spouse or cohabitant). Current smokers smoked on average 13.2 (SD 7.8) cigarettes or other tobacco products per day. The mean duration of abstinence among former smokers was 139.5 months (SD = 104.1, range 1–432).

Use of *snus*

In total, more former than current smokers had ever used *snus* and used it currently (Table 2). This difference was particularly pronounced and statistically significant only among men. Among women, only 141 subjects (13%) had ever used *snus*, and 31 (3%) were current users at the time of the interview. Among subjects who made at least one attempt to quit smoking, slightly more former than current smokers used *snus* during the latest attempt (for ex-smokers this corresponded to the current abstinence period). This difference, however, did not attain the conventional statistical significance among men (Table 2). Large gender differences were also recorded concerning current use and use at the latest attempt to quit smoking. Among current *snus* users, former smokers tended to report higher *snus* consumption than did current smokers (data not shown).

An overview of the main reason for starting using *snus*, reported by 598 ever-users, is displayed in Table 3. The most common single citations included direct or indirect reference to harm reduction, without significant differences between the two groups. The intention to reduce/quit smoking to motivate the use of *snus* was given more often by women than by men ($P = 0.03$), especially among current smokers.

Table 1 Socio-demographic characteristics of current and former smokers in a national sample, Sweden 2000.

	Current smokers		*Former smokers*	
	n	%	n	%
Gender				
Men	424	43.0	488	48.8
Women	561	57.0	512	51.2
$\chi^2_{1\ d.f.} = 6.616$, $P = 0.01$				
Age (years)				
25–29	78	7.9	39	3.9
30–34	118	12.0	73	7.3
35–39	125	12.7	137	13.7
40–44	163	16.6	170	17.0
45–49	193	19.6	242	24.2
50–55	308	31.3	339	33.9
$\chi^2_{5\ d.f.} = 31.192$, $P < 0.0001$				
Education				
Compulsory school	267	27.3	219	22.1
Senior high school	490	50.0	450	45.3
College or above	222	22.7	324	32.6
$\chi^2_{2\ d.f.} = 25.400$, $P < 0.0001$				
Living in couple				
No	673	68.3	819	81.9
Yes	312	31.7	181	18.1
$\chi^2_{1\ d.f.} = 48.986$, $P < 0.001$				
Annual income (USDth)				
<19	401	40.7	258	25.8
19–38	377	38.3	416	41.6
>38	207	21.0	326	32.6
$\chi^2_{2\ d.f.} = 59.407$, $P < 0.0001$				

Table 2 Number and proportion (%) of current and former smokers reporting use of *snus*.

	All subjects		*Men*	
	n	%	n	%
Ever use				
Current smokers	269	27.3	190	44.8
Former smokes	329	32.9	267	54.7
	χ^2 1 d.f. = 7.37, $P = 0.007$		χ^2 1 d.f. = 8.90, $P = 0.003$	
Current use				
Current smokers	98	10.0	84	19.8
Former smokers	158	15.8	141	28.9
	χ^2 1 d.f. = 15.12, $P < 0.001$		χ^2 1 d.f. = 10.07, $P = 0.002$	
Use at the latest quit attempt				
Current smokers[a]	97	12.3	75	23.0
Former smokers	163	16.3	140	28.7
	χ^2 1 d.f. = 5.84, $P < 0.016$		χ^2 1 d.f. = 3.25, $P = 0.072$	

[a]Only smokers with previous quit attempts included.

Table 3 Main reason for starting using snus reported by current and former daily smokers who ever used *snus*.

Reason[a]	*Current smokers (%)*	*Former smokers (%)*
1. Help to stop smoking	19.7	21.3
2. Smoking reduction	7.1	4.6
3. Health concern: *snus* less dangerous than smoking	1.5	2.4
1 + 2 + 3	28.3	28.3
4. Suggested by relatives or friends	2.6	2.4
5. Offered/suggested during the military service	1.9	0.6
6. Offered/suggested within sport teams/activities	1.1	0.3
7. Alternative to NRT	0.7	1.5
8. *Snus* cheaper than smoking	1.5	0.9
9. Smoking forbidden on the work-place	3.4	1.8
10. Smoking forbidden in other public places	2.2	0.9
11. Smoking became uncomfortable	1.1	1.2
12. Was offered to try, found it pleasant, social circumstances	13.4	17.6
13. Other[b]	27.9	28.3

[a]Only reasons given by at least 1% of the respondents in each group are listed.
[b]The most frequent answers to the open-ended question fell into three groups: curiosity (28% of CS and 41% of FS); aid to quit/substitute for smoking (17% of CS and 8% of FS); social pressure (15% of CS and 14% of FS).

Smoking cessation or reduction

The mean number of cigarettes smoked per day was lower among smokers using *snus* than among smokers who did not, particularly among men (Table 4). The proportion of current smokers smoking less than 10 cigarettes/day was nearly twice as high among users of *snus* than among non-users (44% versus 24%, respectively, data not shown). Moreover, among smokers of less than 20 cigarettes a day there was an inverse relation between amount of *snus* consumed in a week and number of cigarettes smoked in a day (data not shown).

The mean duration of abstinence among former smokers was, if anything, longer among never users of *snus* than among ever users, although this difference did not attain the statistical significance. The same pattern was seen with use of *snus* during the latest (current) abstinence period (Table 4). Among 140 former male smokers who used *snus* at the beginning of the current abstinence period (latest attempt) 69% were current users (median duration of abstinence 72 months).

Table 5 reports the adjusted odds ratios of being a former, rather than a current, daily smoker according to use of *snus*. Conditionally on age, education and use of NRT there was a 70–80% increased probability to be a former rather than a current smoker with past or current use of *snus*. Having used *snus* at the latest attempt to quit smoking increased the probability of being currently

Table 4 Amount of daily smoking among current smokers and duration of abstinence among former smokers according to use of *snus*.

Current smokers	*Mean no. of cigarettes/day*	*SD*	*Significance*
All subjects			
Current use of *snus*	11.1	10.1	$P < 0.05$[a]
No current use of *snus*	13.4	7.4	
Men			
Current use of *snus*	11.0	9.8	$P < 0.05$[2]
No current use of *snus*	15.1	8.7	
Former smokers	*Mean duration of abstinence (months)*		
All subjects			
Ever used *snus*	131.4	103.5	$P > 0.05$[a]
Never used *snus*	143.5	104.3	
Snus in the current abstinence period	127.5	103.7	$P > 0.05$[a]
No *snus* in the current abstinence period	142.0	104.1	
Men			
Ever used *snus*	138.2	105.7	$P > 0.05$[b]
Never used *snus*	157.1	108.3	
Snus in the current abstinence period	134.6	107.3	$P > 0.05$[b]
No *snus* in the current abstinence period	151.6	106.9	

[a]Multiple factors ANOVA, including age, gender and NRT use.
[b]Multiple factors ANOVA, including age and NRT use.

Table 5 Odds ratio (OR) and confidence interval (95% CI) of being a former smoker among men, according to use of *snus*.

Use of snus	*OR*[a]	*95% CI*
Ever use		
No	Ref[b]	–
Yes	1.72	1.30–2.28
Current use		
No	Ref[b]	–
Yes	1.81	1.31–2.53
At the latest quit attempt[c]		
No	Ref[b]	–
Yes	1.54	1.09–2.20

[a]Adjusted for categories of age, education and NRT use (past, current, none).
[b]Reference category.
[c]Including all former smokers and smokers with previous quit attempts.

abstinent by about 50%. These estimates were not modified appreciably after further adjustment for income and family status.

DISCUSSION

To date only one report of non-medicinal nicotine as an aid to stop smoking has been described in the scientific literature (Tilashalski *et al.* 1998). Our study is the first study where current smoking status has been investigated in relation to smokeless tobacco (*snus*) use in a large population sample.

Our understanding of the dynamics of tobacco use in Sweden is incomplete. The spontaneous shift from smoking to smokeless tobacco use was studied in the 1980s in a national panel interviewed during two household surveys (Tillgren *et al.* 1996). Over 8 years one in four of the 27% daily smokers identified by the time of the first interview had quit tobacco altogether, whereas one in 20 had shifted to *snus*, and only one in 50 had added *snus* to an already existing smoking habit. It appears that smokers who quit smoking in the 1980s turned to *snus* less often compared to the ones interviewed in the present study. Comparisons are, however, hampered by different recall strategies, calendar periods and age groups on which the two studies are based.

The present study explores another aspect of the complex patterns of tobacco use in Sweden, namely whether the use of *snus* among smokers is linked to the probability to quit smoking. To this end, current and former daily smokers at a given point in time may be seen as the cross-section of a cohort of smokers, some of which have achieved successfully a prolonged abstinence from smoking. First, it was evident in this sample that use of *snus* with the intention to quit smoking is widespread, although almost exclusively among men. Nearly one-third of male ex-smokers used *snus* regularly and as many used it during the process of quitting smoking. Among current smokers with a history of relapse more than one-fifth had used *snus* during their latest attempt to quit.

Secondly, significantly more male ex-smokers had ever used *snus* and still used it regularly compared to current smokers. After controlling for socio-demographic characteristics and use of NRT, this corresponded to a modest, but significantly increased probability of sustained smok-

ing abstinence for users of *snus* compared to non-users. Thirdly, persistent smokers who used *snus* reported lower smoking levels than exclusive smokers.

Our study also confirms the large gender differences in the use of smokeless tobacco seen in population surveys, both in Sweden and the United States (Horn *et al*. 2000). In this sample women used *snus* to a much lower extent than men (although at a much higher rate than the general female population), and their current smoking status was apparently not associated with *snus* use. The determinants of this gender difference are unclear. The motives behind *snus* use are an unlikely explanation as in this study women were, if anything, more prone than men to interpret their initial motivation to start using *snus* in terms of harm reduction. It is possible that men and women who add *snus* use as a further recreational drug belong to very different groups of smokers with regard to nicotine dependence, motivation to quit, social circumstances, smoking-related morbidity, etc. Further studies are warranted to clarify these issues.

An additional, unexpected finding in this study was the agreement between current and former smokers in the alleged motives for their initial use of *snus*. In particular, the proportions referring, directly or indirectly, to the willingness to quit or cut down smoking for health purposes were strikingly similar. This indicates that a consciously instrumental use of *snus* is neither the main nor the only mechanism through which the process of quitting smoking is facilitated. In fact, a larger proportion of quitters than of smokers reported having started using *snus* because of curiosity, prompted by social circumstances.

Finally, it is worth noting that the overwhelming majority of successful quitters of both genders had never used *snus*. The duration of abstinence among these never users was, if anything, longer than among users. This lack of correlation between use of *snus* and duration of abstinence suggests that a majority of Swedish smokers attempting to quit is able to achieve long-lasting abstinence without the help of any nicotine-delivering product. Societal norms and increased awareness of the dangers associated with smoking are clearly at play. This is supported by experiences from other nations. In the 2001 Australian national survey, the prevalence of daily smokers was fairly comparable to that in Sweden (21.1% among men) without availability of other major sources of non-medicinal nicotine (AIHW 2001). Our study, on the other hand, indicates that using *snus* as an aid to quit smoking may be conducive to prolonged nicotine dependence. For instance, a large majority of former smokers who used *snus* as aid to cessation in the beginning of the current abstinence period were still using it years later.

This study had several limitations. Selection processes might have affected current and former smokers differently. For instance, there might have been a selection of former smokers with an a priori higher propensity to quit (e.g. more motivated or less dependent). Further, it is possible that the early quitters who did not turn to *snus* were better motivated, smoked less or were otherwise different from the ones who used *snus* to aid their successful quit attempt. Similar differences in outcomes between groups were observed in the surveys conducted in England and California and in both surveys the authors concluded that subgroups of more motivated and/or less addicted smokers do better with less help (Zhu *et al*. 2000; Buck & Morgan 2001).

As we had no information on former smokers' smoking levels or motivation to quit prior to the current quit attempt, we could not control for these aspects in the analysis. However, in order to inflate the association between *snus* use and successful abstinence spuriously, this selection should also have affected differently *snus* users and non-users, which seems unlikely.

Biases due to differential recall of *snus* use, of duration of abstinence among former smokers or of cigarette consumption among current smokers also seem improbable.

Reports of smoking or of abstinence in this sample were not verified with biochemical methods. However, in population surveys, misclassification of smoking status because of unreliable reports does not appear to be a major problem (Patrick *et al*. 1994). In addition, if this misclassification were not differential across subgroups of *snus* use it would bias the estimated association towards the null.

One of five Swedish men use *snus* on a daily basis, making this tobacco product more common than cigarette smoking among males. Whether the increasing consumption of *snus* in Sweden has been a decisive factor in the reduction of smoking, and the declining trends in the incidence of lung cancer and other tobacco-related diseases, remains to be elucidated (Stenbeck & Rosén 1995). Our study suggests that by using *snus*, Swedish male smokers may have increased their overall chance of abstinence by 70–80%. However, smokers using *snus* in order to quit smoking are probably a minority, even disregarding the gender imbalance. In the present sample, three of four Swedish males who quit smoking in the 1980s and 1990s reported doing so without using *snus*. Also, the duration of abstinence did not increase by the use of *snus*. This suggests that *snus*, however appealing as a tool for risk reduction, is certainly not a necessary component of smoking cessation at the population level.

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REFERENCES

American Psychiatric Association (APA) (1994) *Diagnostic and Statistical Manual Of Mental Disorders (DSM-IV)*, 4th edn. Washington, DC: American Psychiatric Association.

Australian Institute of Health and Welfare (AIHW) (2001) 2001 national drug strategy household survey—state and territory [Supplement]. *Drug Statistics Series, No. 10.* Canberra: AIHW.

Bolinder, G., Alfredsson, L., Englund, A. & de Faire, U. (1994) Smokeless tobacco use and increased cardiovascular mortality among Swedish construction workers. *American Journal of Public Health*, **84**, 399–404.

Bolliger, C. T. (2000) Practical experiences in smoking reduction and cessation. *Addiction*, **95**, 19–24.

Breslow, N. E. & Day, N. E. (1980) *Statistical Methods in Cancer Research, Vol. 1. The Analysis of Case–Control Studies.* Lyon: International Agency for Research on Cancer.

Buck, D. & Morgan, A. (2001) Smoking and quitting with the aid of nicotine replacement therapy in the English population. Results form the Health Monitoring Survey in England 1995. *European Journal of Public Health*, **11**, 211–217.

Henningfield, J. E. & Fagerström, K. O. (2001) Swedish Match Company, Swedish *snus* and public health: a harm reduction experiment in progress? *Tobacco Control*, **10**, 253–257.

Holm, H., Jarvis, M. J., Russell, M. A. & Feyerabend, C. (1992) Nicotine intake and dependence in Swedish snuff takers. *Psychopharmacology (Berlin)*, **108**, 507–511.

Horn, K. A., Gao, X., Dino, G. A. & Kamal-Bahl, S. (2000) Determinants of youth tobacco use in West Virginia: a comparison of smoking and smokeless tobacco use. *American Journal of Drug and Alcohol Abuse*, **26**, 125–138.

Hughes, J. R. (2000) Reduced smoking: an introduction and review of the evidence. *Addiction*, **95**, 3–8.

Huhtasaari, F., Asplund, K., Lundberg, V., Stegmayr, B. & Wester, P. O. (1992) Tobacco and myocardial infarction: is snuff less dangerous than cigarettes? *British Medical Journal*, **305**, 1252–1256.

Huhtasaari, F., Lundberg, V., Eliasson, M., Janlert, U. & Asplund, K. (1999) Smokeless tobacco as a possible risk factor for myocardial infarction: a population-based study in middle-aged men. *Journal of American College of Cardiology*, **34**, 1784–1790.

Kleinbaum, D. G. & Kupper, L. L. (1978) *Applied Regression Analysis and Other Multivariable Methods*. Boston: Duxbury Press.

Kozlowski, L., Strasser, A. A., Giovino, G. A., Erickson, P. A. & Terza, V. J. (2001) Applying the risk/use equilibrum: use medicinal nicotine now for harm reduction [Editorial]. *Tobacco Control*, 10, 201–203.

Lagergren, J., Bergstrom, R., Lindgren, A. & Nyren, O. (2000) The role of tobacco, snuff and alcohol use in the aetiology of cancer of the oesophagus and gastric cardia. *International Journal of Cancer*, **85**, 340–346.

Lewin, F., Norell, S. E., Johansson, H., Gustavsson, P., Wennerberg, J., Biorklund, A. & Rutqvist, L. E. (1998) Smoking tobacco, oral snuff, and alcohol in the etiology of squamous cell carcinoma of the head and neck: a population-based case-referent study in Sweden. *Cancer*, **82**, 1367–1375.

Patrick, D. L., Cheadle, A., Thompson, D. C., Diehr, P., Koepsell, T. & Kinne, S. (1994) The validity of self-reported smoking: a review and meta-analysis. *American Journal of Public Health*, **84**, 1086–1093.

Piasecki, T. M. & Baker, T. M. (2001) Any further progress in smoking cessation treatment? *Nicotine and Tobacco Research*, **3**, 311–323.

Ramstrom, L. M. (2000) Snuff—an alternative nicotine delivery system. In: Ferrence, R., Slade, J., Room, R. & Pope, M., eds. *Nicotine and Public Health*, pp. 159–178. Washington DC: American Public Health Association.

Schildt, E. B., Eriksson, M., Hardell, L. & Magnuson, A. (1998) Oral snuff, smoking habits and alcohol consumption in relation to oral cancer in a Swedish case–control study. *International Journal of Cancer*, **77**, 341–346.

Statistics Sweden (2001) *Living Conditions.* Annual reports. Stockholm: Statistics Sweden.

Stenbeck, M. & Rosén, M., eds (1995) Cancer survival in Sweden in 1961–91. *Acta Oncologica* [Supplement 4]. Oslo: Scandinavian University Press.

Stratton, K., Shetty, P., Wallas, P. & Bondurant, S., eds (2001) *Clearing the Smoke Assessing the Science Base for Tobacco Harm Reduction.* Washington DC: National Academy of Sciences, National Academy Press.

Tilashalski, K., Rodu, B. & Cole, P. (1998) A pilot study of smokeless tobacco in smoking cessation. *American Journal of Medicine*, **104**, 456–458.

Tillgren, P., Haglund, B. J., Lundberg, M. & Romelsjö, A. (1996) The sociodemographic pattern of tobacco cessation in the 1980s: results from a panel study of living condition surveys in Sweden. *Journal of Epidemiology and Community Health*, **50**, 625–630.

Ye, W., Ekstrom, A. M., Hansson, L. E., Bergstrom, R. & Nyren, O. (1999) Tobacco, alcohol and the risk of gastric cancer by subsite and histologic type. *International Journal of Cancer*, **83**, 223–229.

Zhu, S. H., Melcer, T., Sun, J., Rosbrock, B. & Pierce, J. P. (2000) Smoking cessation with and without assistance. A population-based analysis. *American Journal of Preventive Medicine*, **18**, 305–311.

