BRIEF REPORT

# Is Swedish snus associated with smoking initiation or smoking cessation?

**H Furberg, C M Bulik, C Lerman, P Lichtenstein, N L Pedersen, P F Sullivan**

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Nicotine replacement therapies (NRT) are an effective treatment for tobacco dependence, yet most smokers do not quit or remain abstinent. We investigated whether Swedish snus (snuff) use was associated with smoking cessation among males participating in a large population based twin study in Sweden. Snus use was associated with smoking cessation but not initiation. Given that snus delivers comparable nicotine concentrations but carries lesser cancer risk than cigarettes, snus may be a widely used, non-medical form of NRT. Evaluation of the efficacy of snus for smoking cessation should be evaluated in randomised clinical trials.

Tobacco use is the second major cause of death worldwide. Nicotine replacement therapy (NRT) can double smoking cessation rates, but most smokers receiving treatment do not achieve long term abstinence.[1] Additional NRT is needed.

The prevalence of cigarette smoking is notably low in Sweden while the use of snus is increasing. Swedish snus is a moist smokeless tobacco product that contains lower concentrations of cancer-causing tobacco-specific nitrosamines than found in other smokeless tobacco products and cigarettes.[2] While snus delivers similar concentrations of nicotine, it carries substantially lower risks of cancer than cigarettes.[3–8] Male smokers in Sweden appear to be using snus as a form of NRT,[9] despite a lack of data from randomised clinical trials to support its use as a smoking cessation treatment.[10]

We investigated whether lifetime snus use was associated with smoking initiation or cessation to gain insight into its potential role as NRT. It is critical to examine snus' potential dual effects on smoking, given the fear that advocating the use of snus might increase smoking, thereby mitigating its utility as NRT.[11–13]

## PARTICIPANTS, METHODS AND RESULTS

Data from the screening across lifespan twin study (SALT) from the population based Swedish Twin Registry were used.[14] The study protocol was reviewed and approved by the ethical committee of the Karolinska Institute, the Swedish Data Inspection Board, and the Institutional Review Board at the University of North Carolina at Chapel Hill.

All subjects provided written informed consent. Briefly, SALT contains detailed data on tobacco use (type, amount, age at first use, patterns of use, and Fagerstrom test for nicotine dependence (FTND)) from telephone interviews completed by 31 425 twins born in Sweden before 1959. Participants who currently or formerly "smoke(d) at parties", "smoke(d) now and then", or "smoke(d) regularly" were considered "ever smokers". Participants who "only tried cigarettes" or "never smoked" were considered "never smokers". We classified participants as "ever snus user" if they currently or formerly used snus "now and then" or "regularly"; otherwise they were classified as "never snus user". The questionnaire did not specifically describe what was meant by "regular" or "now and then" tobacco use, rather it was up to the participant to interpret and select the type of tobacco user they considered themselves to be. Since the lifetime prevalence of any snus use was only 2.5% among females, we restricted our analyses to males (n = 14 932).

To investigate whether snus use was associated with smoking initiation, we compared men who used snus *before* they started smoking to men who never used snus in relation to any lifetime smoking (ever versus never "regular" or "now and then" cigarette smokers). To address whether snus use was associated with smoking cessation, we compared men who used snus *after* they began smoking to men who never used snus in relation to smoking status at the time of interview (former versus current "regular" or "now and then" smokers).

Odds ratios (OR) and 95% confidence intervals (CI) were estimated with age adjusted logistic regression models and generalised estimating equations to account for clustering of twin pairs. Stratified analyses were performed to examine whether the associations for smoking cessation remained in subgroups of smokers (heavy versus light smokers; high versus low FTND scores).

Table 1 presents the distributions of tobacco use. Of the 14 932 males that participated in SALT, 14 424 (96.6%) had tobacco use data and ages at initiation. Of these men, 9151 (63.5%) reported smoking during their lifetime. Of the smokers, 7880 (86.1%) reported that they smoke(d) "regularly", 669 (7.3%) smoke(d) "now and then", and 602 (6.6%) "smoke(d) at parties". The prevalence of current smoking status was highest for "now and then" smokers (39.2%) as compared with "regular" smokers (34.0%) and "party" smokers (23.1%). The prevalence of any lifetime snus use in SALT was 28.5% (n = 4119), the majority of whom used snus regularly (n = 3704, (89.9%)).

"Regular" and "now and then" snus use were inversely associated with smoking initiation (table 2). Only 4.1% of men who ever smoked used snus "regularly" before they started smoking, while 18.5% of non-smokers had used snus "regularly". The odds ratio (OR) for "regular" snus use and ever smoking status was 0.2 (95% confidence interval (CI) 0.2 to 0.3). Despite smaller sample sizes, a similar pattern was observed for men who reported they used snus "now and then". Only 0.5% of men who ever smoked used snus "now and then" before they started smoking, while 1.1% of never smokers reported that they used snus "now and then". "Now and then" snus use was also inversely associated with ever smoking status (OR 0.5, 95% CI 0.3 to 0.7), suggesting that men who used snus "regularly" or "now and then" before they began smoking were less likely to ever smoke.

**Abbreviations:** FTND, Fagerstrom test for nicotine dependence; NRT, nicotine replacement therapy; SALT, screening across lifespan twin study

**Table 1** Distributions of cigarette smoking and snus use among males in the Swedish Twin Registry

| | Ever smoker (n = 9151, 63.5%) | | | | | | Never smoker |
|---|---|---|---|---|---|---|---|
| | Ever regular smoker (n = 7880, 86.1%) | | Ever now and then smoker (n = 669, 7.3%) | | Ever party smoker* (n = 602, 6.6%) | | (n = 5273, 36.5%) |
| | Current regular smoker (n = 2683, 34.0%) | Former regular smoker (n = 5197, 66.0%) | Current now and then smoker (n = 262, 39.2%) | Former now and then smoker (n = 407, 60.8%) | Current party smoker (n = 139, 23.1%) | Former party smoker: (n = 463, 76.9%) | |
| **Regular snus use (n = 3704, 25.6%)** | | | | | | | |
| Began using snus *before* cigarettes | 61 | 147 | 16 | 38 | . | . | NA |
| Began using snus *after* cigarettes | 324 | 1701 | 57 | 70 | . | . | NA |
| Only used snus, no cigarettes | NA | NA | NA | NA | NA | NA | 976 |
| Began using both at same time | 47 | 230 | 13 | 24 | . | . | NA |
| **Now and then snus use (n = 415, 2.9%)** | | | | | | | |
| Began using snus *before* cigarettes | 11 | 10 | 2 | 6 | . | . | NA |
| Began using snus *after* cigarettes | 100 | 137 | 13 | 20 | . | . | NA |
| Only used snus, no cigarettes | NA | NA | NA | NA | NA | NA | 60 |
| Began using both at same time | 20 | 22 | 3 | 11 | . | . | NA |
| **Never used snus (n = 10305, 71.5%)** | 2120 | 2950 | 158 | 238 | 139 | 463 | 4237 |

*Ever ''party'' smokers did not contribute ages at onset of tobacco use, so we could not calculate the age they started smoking in relation to snus use.
NA, not available.

**Table 2** Age adjusted odds ratios (OR) (95% confidence intervals (CI)) for ''regular'' and ''now and then'' snus use in relation to any lifetime cigarette smoking among males in the Swedish Twin Registry

| | Ever smoker* | | Never smoker | | OR (95%CI) |
|---|---|---|---|---|---|
| Regular snus use | 262† | 4.1% | 976 | 18.5% | 0.2 (0.2 to 0.3) |
| Now and then snus use | 29† | 0.5% | 60 | 1.1% | 0.5 (0.3 to 0.7) |
| Never used snus | 5466 | 95.4% | 4237 | 80.4% | 1.0 |

*''Ever smoker'' includes men who reported smoking ''regularly'' and ''now and then''. Men who smoked ''at parties'' were excluded since they did not contribute ages at onset of tobacco use.
†Men who began using snus *before* cigarettes.

''Regular'' snus use was associated with smoking cessation among ''regular'' and ''now and then'' smokers (table 3). The proportion of former smokers who used snus ''regularly'' (34.6%) was higher than the proportion of current smokers who used snus regularly (13.7%). The OR for ''regular'' snus use and former smoking status was 3.7 (95% CI 3.3 to 4.2), indicating that men who used snus ''regularly'' were over three times more likely to be former smokers than current smokers. No association was observed between ''now and then'' snus use and smoking cessation (OR 1.1, 95% CI 0.9 to 1.4). Thus, it appears that only ''regular'' snus use has an impact on smoking cessation.

## DISCUSSION

Consistent with recent studies,[2 9 15–19] we observed that snus use was associated with smoking cessation, not initiation. Our results support the idea that snus is a type of naturalistic and non-medical NRT that smokers in Sweden may be using to enhance smoking cessation efforts.[9] We acknowledge the cross sectional nature of our data and assert that this correlation is not necessarily causal. Taken together with the information presented in a recent debate over the potential of snus as a smoking cessation aide,[2] we suggest that randomised clinical trials are needed to investigate the utility and risks of snus as NRT under controlled conditions.

We are aware that advocating the use of one addictive tobacco product to diminish the harm from another is a controversial issue, particularly as data supporting the use of snus as NRT could enhance the market of the tobacco industry. Clearly, eliminating all forms of tobacco use would have the most beneficial impacts on world health; however, many smokers are unable to achieve lasting smoking cessation. From a harm reduction perspective, should snus be shown to be as effective as or superior in efficacy to existing NRTs without having adverse health consequences, it may represent a more acceptable means by which to reduce tobacco related health burden.

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**Table 3** Age adjusted OR (95% CI) for smoking cessation (former versus current smokers) by snus use among males in the Swedish Twin Registry

| | Former smoker | | Current smoker | | OR (95% CI) |
|---|---|---|---|---|---|
| Regular snus use | 1771† | 34.6% | 381† | 13.7% | 3.7 (3.3 to 4.2) |
| Now and then snus use | 157† | 3.1% | 113† | 4.1% | 1.1 (0.9 to 1.4) |
| Never used snus | 3188 | 62.3% | 2278 | 82.1% | 1.0 |

*''Former smokers'' and ''current smokers'' includes men who reported smoking ''regularly'' and ''now and then''. Men who smoked ''at parties'' were excluded since they did not contribute ages at onset of tobacco use.
†Men who began using snus *after* cigarettes.

## What this paper adds

This brief report presents findings that Swedish snus (oral snuff) is being used as a naturalistic form of nicotine replacement therapy. We suggest that randomised clinical trials be conducted to assess the efficacy of snus as a smoking cessation aide and to evaluate whether any adverse health consequences result.

## CONTRIBUTORS

H Furberg conducted the data analysis and wrote the manuscript. C Bulik provided critical revision for the manuscript for important intellectual content. C Lerman assisted in conception and analytic strategy of research question and contributed to manuscript revisions. P Lichtenstein and N Pedersen assisted in conception and analytic strategy of research question, contributed to manuscript revisions and provided the data from the Swedish Twin Registry. P Sullivan funded the analysis, supervised the data analysis and contributed to manuscript revisions. All authors reviewed and approved the final version of the manuscript.


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## Notes