

Relative harm of snus and cigarettes: what do Norwegian adolescents say?

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ABSTRACT

Background: The public receives mixed messages about the harmfulness of alternative tobacco products to cigarettes, and little is known about what present and potential users of these products actually think about their relative harmfulness.

Methods: In a nationally representative survey of 2415 Norwegian adolescents aged 16–20 years, participants were asked to rate the harmfulness of various available tobacco products and their own use of snus and cigarettes. A study was undertaken to examine how adolescents rate the relative harm of tobacco products in general, and snus and cigarettes in particular, and how this varies with age, gender and their own use of snus and smoking.

Results: Cigarettes were generally rated as more harmful than snus, but 41% still rated snus as equally or more harmful than cigarettes. Male participants reported lower harm from all products than females. Being a snus user was associated with lower ratings of harm for snus, but being a smoker was not associated with reporting of harm for cigarettes.

Conclusions: Compared with the current scientific consensus, the participants overrated the harmfulness of snus and, as such, our results suggest a potential for changing peoples' perceptions of the relative health risks of various tobacco products. To the extent that health information affects consumption, accurate information on relative risks may lead more people to choose snus over cigarettes.

Norway is one of the countries where a significant proportion of the population frequently uses a smokeless tobacco product. The use of snus has increased in the last decade,¹ and today approximately 10% of men and 1% of women report using snus on a daily basis.² These rates will, however, most likely increase as a recent survey on Norwegian adolescents showed that the use of snus has overtaken smoking as the nicotine product of choice and, among female adolescents, the rate of snus users tripled from 2004 to 7% in 2007.³ The increase coincides with the introduction of a smoking ban in public places in 2004, which presumably increased the relative use of snus compared with cigarettes.

There is scientific consensus that snus is much less harmful for the user's health than smoking.^{4–6} While both are tobacco products, the combustion process in smoking generates many of the very harmful components.⁴ However, snus still contains nicotine which, in theory, should cause direct harm in cardiovascular disease⁷ and, although the evidence is not conclusive, snus use is linked to an increased risk of several types of cancer.⁴ It is also

possible that the use of snus indirectly causes harm as a “gateway” into smoking. Some evidence suggests the opposite—that snus use may actually reduce the risk of later smoking initiation^{8–9} and that switching to snus is helpful for many who try to quit smoking.⁹ At present there is insufficient evidence to draw firm conclusions regarding these matters, and public health agencies and authorities therefore refrain from promoting snus as a possibly healthier substitute for cigarettes and a means of reducing smoking-related health problems by helping people to quit. On the contrary, many uphold that the health risks associated with these products are similar.¹⁰ This discussion of the role of snus in tobacco control has now become a subject of debate in leading medical journals,^{11–14} despite the fact that most of their readers live in countries where snus is illegal or represents a marginal market share.

Dissemination of reliable health information is one of the key tools of public health action, and it is generally assumed that informing the public about health-compromising behaviour will help to prevent such behaviour over time. However, little is known about how the population and potential users view the risks involved in using the various available tobacco products. Data from a sample of adult smokers in Australia, Canada, the UK and USA suggest that they overestimate the harmfulness of smokeless tobacco alternatives to cigarettes.^{15–16} A representative sample of US high school seniors suggest that both smokers and non-smokers have an inflated view of the harm associated with the use of smokeless tobacco.¹⁷ Evidence from Sweden suggests the same is true there.¹⁸ Apart from the latter, these studies come from countries where snus has been an uncommon and alternative tobacco product. We wanted to establish whether the same patterns could be observed in Norway, a country where snus has been relatively common for many years. In particular, we were interested in studying these perceptions in adolescents aged 16–20 years as this age is of particular importance in establishing health behaviours. We also wanted to examine whether there are differences in the perceived relative harmfulness of using snus and smoking cigarettes between users and non-users, and how the perceptions of relative harmfulness are influenced by gender and age.

METHODS

The data used in the present study are from a survey on tobacco use and related topics in Norwegian adolescents and young adults aged 16–20 years. The survey was funded by the

Norwegian Directorate for Health and Social Affairs. A sample of 5000 potential participants was established by random selection from the Norwegian population registry within predefined quotas reflecting age, gender and geographical distribution in the source population. Potential participants were sent a letter with brief information about the study and the interview procedure involved, and were informed that on participation they would enter a draw of 10 gift certificates, each worth Nkr 500 (about £50).

Data collection procedure

The data were collected over a 2-week period starting in mid September 2007 by a commercial marketing research institute (Synovate MMI Inc) using telephone interviews. A total of 5757 matching telephone numbers were obtained for the 5000 potential participants. Of these, 338 were faulty or did not lead to the right person. During the interview process, 1246 persons could not be reached and 1188 responded to the call but refused to be interviewed. The data collection ended with a sample of 2415 respondents (1211 male and 1204 female). The remaining 570 telephone numbers were redundant after the goal number of participants in each of the quotas described above had been reached.

Variables

The main variables in the study are based on a set of questions regarding health hazards associated with various available nicotine products. First, the participants were told that a range of nicotine products would be listed and that they would be asked to rate them successively on a 7-point scale ranging from 1 (harmless) to 7 (very harmful) or a "don't know" category. The interviewers then listed the eight products in the following order: loose snus (snus in loose form), prepackaged snus (snus wrapped in "tea-bag" portion packages), pipe tobacco, cigars/cigarillos, "roll-your-own" tobacco, factory-made cigarettes, low-tar factory-made cigarettes and nicotine replacement products (nicotine chewing gum and patches). The ratings were used as continuous variables to estimate mean ratings for each product. For direct comparisons of cigarettes and snus (the most common products in this age group), variables were constructed for each participant that reflected the mean rated harmfulness of factory-made cigarettes and low-tar cigarettes, and the mean rated harmfulness of loose snus and prepackaged snus.

Participants' smoking behaviour and use of snus were measured for each product by asking: "Have you ever smoked (cigarettes)/tried snus?" If yes, the participant was asked: "How often do you smoke (cigarettes)/use snus these days?" with the following alternative answers provided: "every day", "every week", "less than once a week" and "not at all". Relatively few reported weekly use and, in agreement with previous studies of user status in this age group,³ those reporting using snus and/or smoking every day or every week were grouped together as "snus users" and "smokers".

Statistical analysis

The results are presented as overall mean scores on harmfulness across the various products and split scores between gender and smoker/snus use status. Differences in mean scores were tested using independent sample *t* tests. To examine if any differences found in the *t* tests were spurious or caused by one of the other variables, we predicted perceived harmfulness of the products in a linear regression model which included age, gender and own

use of either cigarettes or snus. In cases where two factors remained significant, we tested for statistical interactions using another linear regression model where first both variables were included and, in a second step, the product term of the variables of interest were entered. The applied test of significance was the increase in F-value in the regression model following addition of the interaction.

RESULTS

Most participants had an opinion on the harmfulness of the various products and only 0.8% (factory-made cigarettes) to 2.4% (pipe tobacco) used the "don't know" category when asked to rate the harmfulness of various tobacco products. In table 1, the products are ranked in descending order of harmfulness. Roll-your-own tobacco was seen as the most harmful form of nicotine product of those included here with a mean (SD) score of 6.07 (1.06) on the 7-point scale. At the lower end, the adolescents gave a mean (SD) score of 3.02 (1.41) for tobacco replacement products such as nicotine chewing gum and patches. Males and females used the scale differently and, across all product types, male adolescents reported less harmfulness than female participants (all $p < 0.001$, table 1).

Judging by the overall mean values, snus was ranked as less harmful than most tobacco products intended for smoking. However, loose snus was ranked as slightly more harmful than low-tar cigarettes, which again ranked as more harmful than prepackaged snus. In direct comparison, 59% (95% confidence interval (CI) 57% to 61%) rated snus as less harmful than cigarettes, 19% (95% CI 18% to 21%) rated them as equally harmful, and 22% (95% CI 20% to 24%) considered that snus was more harmful than cigarettes.

The use of snus was associated with reporting less harmfulness in loose snus, prepackaged snus and cigars/cigarillos, and also reporting a slightly higher level of harm for roll-your-own tobacco (table 2). On the other hand, smokers did not rate cigarettes as any less harmful than non-smokers; no significant differences were found between smokers and non-smokers in reported harmfulness of any products other than prepackaged snus, which smokers rated as slightly less harmful, and roll-your-own tobacco which they rated as slightly more harmful than non-smokers (table 2).

Within the small age range of the study participants, higher age still predicted higher levels of perceived harmfulness in pipe tobacco, roll-your-own tobacco, factory-made cigarettes and low-tar cigarettes (table 3). The largest mean difference was found in the perceived harmfulness of pipe tobacco, with a mean score 0.5 points lower in those aged 16 years than in those aged 20 (5.5 vs 6.0).

Table 1 Perceived harmfulness of tobacco products by gender ranked according to the mean of the entire sample

Product	Overall		Males		Females	
	Mean	SD	Mean	SD	Mean	SD
Roll-your-own tobacco	6.07	1.06	6.00	1.12	6.14	1.00
Factory-made cigarettes	5.92	1.07	5.79	1.10	6.06	1.02
Pipe tobacco	5.71	1.20	5.61	1.26	5.81	1.14
Cigar/cigarillo	5.60	1.37	5.42	1.50	5.77	1.19
Loose snus	5.06	1.37	4.74	1.44	5.39	1.20
Low-tar cigarettes	5.04	1.25	4.90	1.30	5.18	1.18
Prepackaged snus	4.63	1.36	4.29	1.39	4.97	1.23
Nicotine replacement products	3.02	1.41	2.79	1.38	3.26	1.42

SD, standard deviation.

Table 2 Mean (SD) scores for perceived harmfulness of tobacco products by own use status

Product	Non-smokers		t (p Value)	Non-snus users		Snus users	t (p Value)
Roll-your-own tobacco	6.05 (1.07)	6.17 (1.00)	2.05 (p<0.05)	6.05 (1.06)	6.18 (1.07)	2.20 (p<0.05)	
Factory-made cigarettes	5.92 (1.05)	5.92 (1.15)	0.00 (p = 0.00)	5.91 (1.07)	5.99 (1.06)	1.27 (p = 0.08)	
Pipe tobacco	5.69 (1.19)	5.80 (1.25)	1.69 (p = 0.09)	5.70 (1.21)	5.77 (1.16)	0.99 (p = 0.32)	
Cigar/cigarillo	5.61 (1.34)	5.53 (1.48)	-1.05 (p = 0.29)	5.63 (1.33)	5.41 (1.51)	-2.72 (p<0.05)	
Loose snus	5.07 (1.35)	4.99 (1.46)	-1.04 (p = 0.30)	5.12 (1.34)	4.73 (1.44)	-4.93 (p<0.001)	
Low-tar cigarettes	5.02 (1.22)	5.10 (1.39)	1.21 (p = 0.23)	5.03 (1.24)	5.08 (1.28)	0.70 (p = 0.48)	
Prepackaged snus	4.68 (1.34)	4.42 (1.42)	-3.42 (p<0.001)	4.72 (1.33)	4.17 (1.37)	-7.48 (p<0.001)	
Nicotine replacement products	3.02 (1.39)	3.01 (1.56)	-0.13 (p = 0.90)	3.04 (1.40)	2.92 (1.49)	-1.46 (p = 0.14)	

Since male adolescents rated harmfulness lower on all products than females and also use snus more often, post hoc analyses were performed to identify any interaction effects between gender and user status in reported harmfulness. Interaction tests were also performed in those cases where both age and gender were significantly associated with rated harm in table 3. No significant interactions were found in any of these analyses.

DISCUSSION

Main findings

This study, based on the general adolescent population, suggests that snus in general is rated as a less harmful product than cigarettes. However, 41% still rated snus as equally or more harmful than cigarettes. Furthermore, loose snus was on average rated as more harmful than low-tar cigarettes. Male adolescents tended to report less harm across all products, and those who use snus rated snus as less harmful and cigarettes as more harmful than non-users.

Strengths and limitations

The participants were randomly selected using the Norwegian population registry and recruitment procedures were employed to ensure a representative sample of Norwegian adolescents aged 16–20 years. Most of the few previous studies on this topic have asked smokers only about awareness and perceived harmfulness of alternatives to cigarettes. In contrast, this study is based on the general population, eliciting the views of both users and non-users of snus and cigarettes.

One limitation of the study is the participation rate of 67%. There were about as many who refused to participate as those whom the interviewers could not reach. The reasons for not being able to reach individuals on the list are largely thought to be trivial with regard to the introduction of bias. Considering those who actively refused to participate, we assume that most

refused because of the inconvenience but there is also the possibility that some refused because of the topic of the study. If so, there may, for instance, be more smokers among the non-responders, and those smokers who did participate rated snus as less harmful than non-smokers. Thus, more non-response among the smokers could lead to a slight overestimate in the relative harmfulness of snus. The proportion of smokers and snus users was, however, in line with that expected from comparable studies,¹ suggesting minimal impact of this potential problem. Bias beyond these speculations cannot be excluded but, to the best of our knowledge, there are no indications of biases resulting from systematic non-participation that would alter the conclusions of this study.

It is possible that the order of products in the interview could reduce reported differences in some cases. Loose snus was the first item, and someone who regards this as a harmful product might have rated it near the top of the scale, leaving less room for expressing large differences when later asked about cigarettes.

Interpretation

Despite possible limitations, this study suggests that snus is perceived as more harmful to health than current scientific evidence suggests. We asked about harmfulness to health, which can be considered a rather generic measure of harm. As a consequence, we do not know on which aspect or harmful mechanism the respondents based their answers. There are several possibilities. They may have related the question of harm to nicotine. This could serve to explain the clustering of all the products on the higher end of the harmfulness spectrum, as all the products include nicotine. Also, the addictive properties of nicotine are supposedly quite well known in the population. If addiction in itself is seen as a health problem, the participants could justly claim that there is not that much difference between cigarettes, snus and other tobacco products containing

Table 3 Associations between harmfulness of tobacco products and snus use, smoking, age and gender*

Predicted harmfulness of	Age		Gender		Snus use		Smoking	
	B	p Value	B	p Value	B	p Value	B	p Value
Roll-your-own tobacco	0.09	<0.001	0.16	<0.001	0.14	<0.05	0.05	0.35
Factory-made cigarettes	0.06	<0.001	0.30	<0.001	0.16	<0.05	-0.05	0.36
Pipe tobacco	0.09	<0.001	0.21	<0.001	0.10	0.17	0.05	0.44
Cigar/cigarillo	0.02	0.34	0.33	<0.001	-0.12	0.13	-0.08	0.29
Loose snus	0.05	<0.05	0.62	<0.001	-0.20	<0.05	-0.09	0.22
Low-tar cigarettes	0.12	<0.001	0.30	<0.001	0.10	0.16	0.01	0.94
Prepackaged snus	0.03	0.11	0.62	<0.001	-0.34	<0.001	-0.24	<0.05
Tobacco replacement products	0.02	0.43	0.48	<0.001	0.04	0.67	-0.02	0.76

*The regression coefficients (B) presented for each factor (age, gender, snus use and smoking) reflect their association with perceived harmfulness after adjustment for confounding from the other factors.

What this paper adds

- Snus is one of the more commonly used smokeless tobacco products. There is scientific evidence to suggest that snus is not harmless, but that it is much less harmful for the user's health than cigarettes. Little is known about what potential users think of the relative harmfulness of these products.
- In this study, 41% of the adolescents asked reported that snus is as harmful as or more harmful than cigarettes.
- To the extent that health information affects consumption, accurate information on relative risks may lead more people to choose snus over cigarettes.

nicotine. It is also reasonable to think that use of any of these products can entail a risk for specific diseases such as cancer.¹⁹ This has certainly been proved in the case of cigarettes, but scientific reports on a possible increased risk of cancer from snus use have also received attention in the mass media.¹⁹ In Norway, snus packages used to come with cancer warnings like those found on cigarette packages, but this has now been removed. To the extent that the questions of harmfulness were answered based on cancer risk, the ranking of the products was within reason, but differences in scores were smaller than current science would suggest. It is likely that there is no single specific factor that constitutes "harmfulness" in the participants' understanding and, as such, the results should be seen as a measure reflecting a compound of these.

In Norway and elsewhere, many anti-smoking campaigns have been run, and lately these have been more aggressive and graphic than previously. Snus use has not been the target for any campaigns to date, but there have been debates in the public media with some headlines suggesting health and cancer risks from snus while others claim that snus is harmless and a recommended aid to quit smoking. The lower standard deviations on the smoking items in this study suggest that the message with regard to cigarettes is much more uniformly received than is the case of snus. Snus users were more in line with the current scientific consensus than cigarette smokers. This could in part be related to sociodemographic differences between the groups. It is well known that cigarette smoking is now associated with lower social status. The inverse relationship with social status was recently found for female snus users in Norway, while there were no social status differences in male users of snus.²⁰ It is possible that those of higher social status respond faster to changes in norms around cigarettes and more quickly turn to alternative products like snus. Given that health-promoting research findings are more quickly adopted among those of higher social status, snus users would be expected to hold opinions closer to that of the scientific consensus. Unfortunately, no items on social status were available for this study to address this possibility empirically.

The female adolescents in this study reported more harmfulness across all the products. This could simply reflect a general difference between the genders in risk perceptions. Nicotine has vasoconstrictive effects with potential adverse influences on fetal growth and development,²¹ and this aspect of harm might be more readily adopted by females and contribute to the increased risk reported across all the nicotine-containing products.

CONCLUSION

Current evidence suggests that snus is much less harmful than cigarettes,^{4,6,19} but the results of this study indicate that many adolescents believe the health risks of snus and cigarettes are similar. To the extent that health risk has an impact on the use of tobacco products among adolescents, it could be beneficial to communicate more clearly that snus is less harmful to health than cigarette smoking and other types of smoked tobacco. However, this must be balanced against the risk of increasing the use of a tobacco product which, after all, still compromises health.

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Competing interests: None.

Ethics approval: The study protocol was presented to the Regional Committee for Medical Research Ethics (REK-Vest) and could be carried out within the general permits of Synovate MMI Inc. The sample of participants was drawn from the Norwegian population registry with approval from the Norwegian Tax Administration.

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