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## **Tobacco harm reduction in the real world: has the availability of snus in Norway increased smoking cessation?**

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## CASE STUDY:

### **Tobacco harm reduction in the real world: has the availability of snus in Norway increased smoking cessation?**

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#### **Abstract**

*Purpose:* In Norway, snus (low nitrosamine smokeless tobacco) are allowed to compete with cigarettes for market share, and over the past decades the prevalence of snus users has increased as the prevalence of smokers has decreased. We have summed up the findings from research that have tried to identify the role of snus in smoking cessation and how availability to snus in Norway has affected the magnitude of concomitant use of snus and cigarettes.

*Design:* Relevant results from Norwegian studies are presented, and, if possible, compared to findings from studies conducted in other countries.

*Findings:* Snus is reported by ever-smokers to be the most preferred method for quitting, and former smokers make up the largest segment of Norwegian snus users. The quit rate for smoking is consistently observed to be higher for snus users than for smokers who have no experience of use of snus. Moreover, those using snus are more likely to have quit smoking completely or considerably reduced their cigarette smoking, than users of medicinal smoking cessation products. The increase in snus use among men in Norway has not been paralleled by an increase in dual use of snus and cigarettes.

*Research limitations:* The results observed in Norway might not be extrapolated to other countries that do not have the same history of use of snus.

*Practical implications:* The replacement of cigarettes by snus has been the most typical pattern of use in Norway, and the availability of snus may have been beneficial to public health.

*Originality:* Besides neighbouring Sweden, Norway is the only country the Eurozone with a tradition of snus use. Knowledge about the pattern of snus use in these countries is relevant for policymakers when deciding the legal status of snus in the EU.

**Keywords:** tobacco, smokeless, snus, cigarettes, cessation, dual use

The extent and nature of the impact on public health of making snus available in new markets will depend on the relative risk of snus and smoking, and the relative uptake and use by smokers and non-smokers. Given a medical consensus that snus is approximately 90-95% less harmful than smoking (Levy et al., 2004), the overall effect from snus on public health will come down to the balance between its beneficial effect on smoking prevalence and its adverse effects on overall prevalence of tobacco use (see Benowitz, 2011; Lund, 2009; Le Houezec et al., 2011; McNeill & Munafó, 2012, SCENIHR 2008 for a discussion). Norway and Sweden, with its long tradition of snus use, constitutes a natural laboratory in which we can study how snus competes for market share with cigarettes. The much debated ban on snus in the rest of the European Union leaves these countries as the only in Europe where we have the possibility to observe transitions between cigarettes and snus, and the implication these transitions eventually will have for public health.

Over the past decade there have been positive changes in the Norwegian tobacco market. Total consumption of tobacco has been reduced by 15% since 1985, and at the same time there has been a market shift from combustible to non-combustible tobacco. It is important to emphasize that this market shift has happened in a ‘dark market’ where any active promotion of snus has been banned for decades. Indeed the Scandinavian health authorities have strongly warned smokers against all kinds of snus use even as a method for smoking cessation (Holm et al., 2009). The typical message has been that snus is not a safe alternative to cigarettes. At present, smokers woefully overstate the health risk from snus compared to cigarettes (Øverland et al., 2008; Lund & Scheffels, 2012; see Lund, 2012 for a discussion). Dissemination of information from the authorities to correct such misconceptions might speed up the trajectory from smoking to snus use even more, but it might also – temporary or permanently - increase the proportion of dual users.

The Norwegian Institute of Alcohol and Drug research (SIRUS), a government entity answerable to the Ministry of Health and Care Services, has published a series of studies illustrating the role of snus in smoking cessation and -reduction, and how availability to snus has affected the magnitude of concomitant use of snus and cigarettes. In this case study, the aim is to sum up the findings from this research.

## ***THE ROLE OF SNUS IN SMOKING CESSATION***

### *Use of snus in quit smoking attempts*

In Norway, approximately one quarter of smokers attempt to stop smoking each year (Lund & Lindbak, 2007), but a majority of 75% of those try to quit unassisted (Lund, 2009; Lund et al., 2010a). Among the minority who apply a specific method, snus is most common followed by nicotine chewing gum, self-help materials and nicotine patches (Lund et al., 2010a; Scheffels et al., 2012; Lund & McNeill, 2012a+b; Helleve et al., 2010). This has been the case among male smokers for decades, but recent observations indicates that snus has displaced pharmaceutical nicotine as a cessation tool also among female smokers (Lund & McNeill, 2012a). In the most recent study comprising 1,155 male former daily smokers, Lund (2012) observed that 32% reported to have been using snus at their final quit attempt, while 14% had been using nicotine gum. Among 1,132 male current smokers who had tried (unsuccessfully) to quit smoking, nicotine gum (31%) and snus (30%) were approximately evenly used. A significantly higher proportion of the current smokers who had used snus (alone or in combination) at their last attempt to quit smoking, were *very likely* or *likely* to use snus again (70.0%) compared to retrial with nicotine gum (57%) and nicotine patch (51%). Intentions of retrial with **bupropion** (Zyban) were significantly lower (32%) than retrial with most other methods (Lund, 2012).

One study reported that users of medicinal nicotine products had a greater tendency to use additional methods for quitting smoking, while use of snus seemed to be a more solitary method, and might appear convenient for smokers who for some reason do not want to make use of the NRTs (Lund et al., 2010a). This might be important because the remaining group of smokers increasingly contains a higher proportion of people with social, mental and demographic characteristics associated with reduced ability to stop smoking with traditional methods. For more than twenty years there has been a social gradient in smoking pattern in developed countries, and the search for measures that are tailor-made for smokers with specific characteristics, for example **low** education, have been going on for a long time. Literature reviews have not identified measures that the authorities could implement in order to make the social gradient in smoking pattern less steep (Thomas et al., 2008).

The preference of snus as a method to quit smoking have emerged even if the effect from snus on quitting smoking is not advertised and is unknown to the public, the health authorities advise against its use and the perception of health risks from snus use are exaggerated in the population. Some of the reasons why snus is preferred over medicinal nicotine products might be that the nicotine dose is almost the same as for cigarettes (Lunell & Lunell, 2005; Hatsukami et al., 2007), and that the choice of brand, aesthetic rituals of use and visibility can represent social positioning and self-presentation (Nordby & Wood, 2008). Use of snus can thus – in contrast to nicotine chewing gum and nicotine patches – have functions that are identical to those offered by cigarettes. In addition, snus, similar to cigarettes, tastes of tobacco, and thus has a sensory effect that medicinal nicotine products perhaps lack. This suggests that snus at the moment is the only nicotine product on the Norwegian market that can compete in popularity with cigarettes - as there is a total ban on sale of electronic cigarettes.

### *Association with smoking cessation*

In epidemiological research of tobacco behaviour, the quit ratio is often used to calculate the proportion of people in a population who have stopped smoking (IARC 2008). The quit ratio for smoking is an expression of the number of former regular smokers as a proportion of the total number of people who have ever smoked regularly in a population. Lund et al. (2010b) analysed seven cross-sectional data sets collected in the period 2003-2008 containing a total of more than 10 400 Norwegian ever-smokers. Compared to smokers with no experience of using snus, the quit ratio for smoking was significantly higher for daily snus users in six of the seven data sets. This is consistent with Swedish prospective and retrospective studies that have shown that the quit ratio is higher for smokers who use, or have used snus, than for smokers who have never used snus (Ramström & Foulds, 2006; Gilljam & Galanti, 2003; Norberg et al., 2011 a+b; Stenbeck et al., 2009; Rodu et al., 2002 & 2003; Stegmayr et al., 2005). Moreover, several randomized controlled trials have also demonstrated that smokeless tobacco increases the likelihood of quitting (Barrett et al., 2011; Burton et al., 2009; Caldwell et al., 2010; Carpenter & Gray, 2010; Fagerström et al., 2012; Joksic et al., 2011; Lunella & Curwall 2011).

To replace cigarettes with snus - a product that deliver as much nicotine to the bloodstream (Lunell & Lunell, 2005) – might be more effective for smoking cessation than replacing cigarettes with products that emit far less nicotine to the dependent such as nicotine gum or nicotine patch. This hypothesis is supported by two observational studies in Norway (Scheffels et al., 2012; Lund et al., 2010a). In these studies, self-reported outcome of smokers' attempts to quit smoking was compared according to the applied methods of quitting. After adjusting for other predictors of smoking cessation, a consistent finding was that snus users were more likely to have quit smoking completely or considerably reduced their cigarette smoking, than users of medicinal smoking cessation products. This result was

consistent with one observational study in neighboring Sweden (Ramström & Foulds, 2006). The superior effect from snus over nicotine gum or patch was the case despite the fact that users of medicinal nicotine products had a greater tendency to use additional methods for quitting smoking (Lund et al., 2010a) which would normally increase the probability of a positive result. Also experimental studies indicate that snus is more effective than medicinal nicotine products on quitting smoking (Caldwell et al., 2010; Fagerström et al., 2012; Lunell & Curvall, 2011; Kotlyear et al., 2011).

The enhanced effect from snus over medicinal nicotine products (*efficacy*) combined with the high likeability of snus as a smoking cessation method implies that the impact on smoking abstinence at the population level (*effectiveness*) is much higher from snus.

#### *Prolonged snus use after smoking cessation*

How many smokers who quit smoking with the help of snus, continue to use snus? This research question has been addressed in a couple of Norwegian studies (Lund 2009; Lund et al. 2010a; Scheffels et al., 2012). In one study 62% of those smokers who reported that they had tried to quit by using snus reported that they still used snus at the time of the survey, either daily (44 %) or occasionally (19 %). People who had quit completely or greatly reduced their cigarette consumption with the help of snus, were more likely to use snus on a daily basis than people whose attempt to quit had resulted in less change in cigarette consumption. In comparison, only 10 % who had used nicotine chewing gum or nicotine patches at the last attempt to quit were still using these medicinal nicotine products at the time of the survey (Lund et al., 2010a). It should also be emphasized that a substantial fraction (38%) of those using snus as a method for quitting in fact ended up tobacco-free. This was consistent with a study from Sweden (Ramström & Foulds, 2006). In another study from Norway comprising

more than 2 300 male quitters under the age of 45 years, Scheffels et al. (2012) observed that 46% of those who had used snus on their last attempt to quit were current non-smokers while 26% of those who had used NRT were current non-smokers. 60% of successful quitters and 20% of unsuccessful quitters who had used snus as a method for quitting smoking had continued to use snus on a daily basis after quitting.

The higher rates of snus use among those using snus on their last quit attempt, may be an indication that use of snus when quitting smoking contributes to maintaining dependence to nicotine, and that the method can result in dual use for those whose attempt to quit has been unsuccessful. Against this background, advice against using snus as a method for quitting smoking as a general strategy seems to be sensible. However, the method could be particularly relevant for intransigent smokers who are seriously addicted to nicotine, and who have been unsuccessful in quitting using conventional methods.

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

### ***DUAL USE OF SNUS AND CIGARETTES***

### *The magnitude of dual use*

Even if there is a medical consensus that snus is far less harmful than cigarettes, there is a concern that availability to snus might result in dual use and therefore jeopardize the potential role of snus in a tobacco harm reduction perspective (Tomar et al., 2009; Tomar et al., 2010). Given the fact that the snus epidemic is at present in a relatively progressed stage – at least among men - Norway represent an interesting case in which to study to dual use of snus and cigarettes. Lund & McNeill (2012b) used data from a time-series covering the period 1985-2010, a period in which the market share of snus increased from 5% to above 30%. Among men the segment of dual users of cigarettes and snus varied in a narrow range between 4%-7% for the whole period. The overall percentage of male tobacco users decreased from 54% to 37%, and the share of Norwegian men who reported daily or occasional use of cigarettes, but no other tobacco product, declined from close to half in 1985 to below one in five in 2010. In a diffusion perspective, women have been late adopters of snus, and the prevalence of dual users was negligible (< 1%) for the whole period.

The most typical pattern of dual use is a combination where daily use of one product was paired with occasional use of the other (Hellve et al., 2010; Lund & McNeill, 2012; Lund et al., 2010 a+b). One study showed that 22% of male daily snus users reported to smoke occasionally while 10% were using cigarettes on a daily basis. Among occasional snus users, 41% smoked daily, while 16% smoked occasionally (Lund & McNeill, 2012).

A consistent finding across studies in Scandinavia is that a great majority of dual users have started with cigarettes, while typically below 25% report snus to be their first tobacco product (Ramström & Foulds, 2006; Lund & McNeill, 2012b).

The relatively small and stable magnitude of dual use in Norway resembles what has been observed in neighboring Sweden (Stegmayr et al., 2005; Ramström & Foulds, 2006;

Lundqvist et al., 2009; Ensgröm et al., 2010) – another country with a long history of extensive snus use. In countries where promotion of snus is permitted, dual use may eventually develop to higher proportions than what is observed in Scandinavia. In the US after 2006, nearly the entire smokeless tobacco market is controlled by cigarette manufacturers (Tomar et al., 2009). Although the US Tobacco Bill prohibits the industry to advertise snus to smokers on the basis of lower health, snus is advertised for situational use when smokers cannot smoke due to smoke-free policies (Timberlake et al., 2011). There is a concern that such promotion of snus to smokers could result in dual use rather than complete switching to snus (Tomar et al., 2010; Mejiia et al., 2011). The prevalence of dual use has also been found to be high among smokeless tobacco users in some (Tomar et al., 2010; Bombard et al., 2007; Tomar, 2002), but not all US studies (Zhu et al., 2009), but the magnitude depends very much upon the operational definition of dual use (Kleges et al., 2011).

In a much cited simulation study to evaluate the health impact of snus promotion as part of a harm reduction strategy in the US, the prevalence of dual use was regarded the single most important predictor of population health effects (Mejia et al., 2011). Research on dual use of snus and cigarettes is in its infancy and an exact definition does not exist as yet. Information on prevalence and complexity of dual use will be an essential input in simulation models designed to estimate net effects on public health from the availability to snus. Direct observations of dual use from Norway and Sweden, two countries with a full blown snus epidemic, might be a more valid input in such models than different scenarios of dual use disconnected from any empirical basis, as was the case in a model from the relatively snus-naïve US (Mejia et al., 2011).

*Smokers' motives for additional snus use*

Several studies from Norway (Lund et al., 2010 a+b; Lund & McNeill, 2012b) and Sweden (Ramström & Foulds, 2006; Norberg et al., 2011b), show that former smokers make up the largest segment among daily snus users and former snus users. In accordance with this, Lund & McNeill (2012b) found that a majority of 54% of dual users with a daily intake of snus reported that the purpose of their snus use was to quit smoking. However, consistent with observations in Sweden (Gilljam & Galanti, 2003), this study also indicates that harm reduction issues such as smoking reduction (63%) and smoking substitution (64%) were important motives for additional snus use - motives that go along with nicotine maintenance. Among dual users with intermittent snus use, only 34% reported that the purpose of their snus use was to quit smoking. Smoking reduction (53%) and smoking substitution (56%) were significantly more prevalent reasons to use snus than smoking cessation in this group. Only 25% of the Norwegian dual users say that smoking cessation or smoking reduction was *not* the reason to their snus use (Lund & McNeill, 2012a).

#### *Reduced smoking intensity among dual users*

A potential mechanism by which snus theoretically can reduce tobacco harm is by serving as a partial substitute for cigarettes among continuing smokers, supported here by the large proportion of Norwegian dual users saying that this is why they were dual users. There is some evidence both from the USA (Hatsukami et al., 2004; Tomar, 2002) and Sweden (Gilljam & Galanti, 2003) that dual users of cigarettes and snus smoke fewer cigarettes, on average, than do exclusive smokers. There is also some evidence showing that unsuccessful attempts at using snus to quit smoking is likely to result in reduced smoking intensity (Lund et al., 2010a; Ramström & Foulds, 2006; Carpenter & Gray, 2010). Consistent with these findings, exclusive cigarette smokers in Norway reported a weekly cigarette consumption that

was 40% above that of dual users of snus and cigarettes among men (Lund & McNeill, 2012b).

### *Does dual use delay smoking cessation?*

Snus may have the potential to reduce exposure to tobacco toxins, but snus may also have the unfavourable potential to delay cessation. A prospective study from the US demonstrated that dual users were less likely to achieve abstinence from tobacco over a four-year period compared with exclusive users of either product (Wetter et al., 2002). A recent study conducted in some of the test markets for snus in the USA, revealed that smokers who had no immediate plans to quit were more likely to try snus (Biener et al., 2011). Consistently, Timberlake (2009) and Gartner et al., (2009) also found that the intention to quit smoking was inversely associated with an interest in switching to snus.

In Norway no such difference in intention to quit smoking (within in 6 months) was observed between dual users of snus and cigarettes and exclusive smokers (Lund & McNeill, 2012b). This was consistent with recent findings from Sweden (Ramström & Wikmans, 2011). On the contrary, expectancies of being smokefree five years into the future were significantly more prevalent among dual users than exclusive smokers. Thus, no empirical evidence in support of delayed smoking cessation among dual users was observed in Scandinavia.

### *Dual use – a transient phenomenon?*

Even if the fraction of dual users of snus and cigarettes is small in the total male population in Norway, approximately 10% of daily snus users and 40% of occasional snus users smoke

cigarettes on a regular basis (Lund & McNeill, 2012b). There is some evidence that this relationship is caused by a certain trajectory-of-tobacco-use among dual users; many occasional snus users are at the time of the survey caught in an incomplete transition phase of stopping smoking daily, and will replace cigarettes with daily use of snus later (Wetter et al., 2002; Rodu et al., 2002; Rodu et al., 2003; Ramström & Wikmans, 2011; Lindström & Isacsson, 2002). A review of available literature that was initiated by the Altria Group (tobacco producer) concluded that dual users were more likely to reduce smoking intensity and eventually quit smoking than exclusive smokers, but less likely to stop all tobacco use altogether (Frost-Pineda et al., 2010). However, there is also some evidence from Sweden that dual use is not entirely a transient phenomenon; many ‘some day’ users of snus use both products interchangeably without trending toward either product (Norberg et al., 2011a). Longitudinal research targeting the nature of dual use and its relation to smoking cessation is warranted, as well as research into how this trajectory is influenced by provision of information on relative risks (see Lund, 2012 for a discussion).

### *Snus use among young people*

One concern with harm-reduction products is that they may be used by people with no previous experience with nicotine, or by people who would have managed to quit smoking by other means. If there are many such people, this could result in a net loss for public health. Of special concern is the increase in snus use among young people. There are two factors that worry. First, some fear that snus might be a gateway to future smoking.

The Swedish data, with its prospective and longtime follow-up do not lend much support to the theory that snus is a gateway to future smoking (SCENIHR 2008). In line with this, a Norwegian prospective study found that snus enabled few of the cognitions which usually increase the desire to smoke among young people (Larsen et al., 2012). Another Norwegian

study (Grøtvedt et al., 2012) found that the use of snus at the age of 16 did not increase the risk of becoming a daily smoker at the age of 19, but increased the risk of low-frequency additional use of cigarettes. However, whether this additional use is due to a causal relationship between snus use and subsequent smoking is unknown. At the aggregate level, the correlation between snus use and smoking is negative in the sense that the proportion of young snus users have increased, while the proportion of young smokers have declined. If a strong gateway effect really existed, we should rather expect to find that the increase in snus use was associated with a subsequent increase in the percentage of smokers - and not a reduction.

The other concern is rooted in a concern that the increase of snus use is caused by an influx of young non-smokers, who in the absence of snus would have remained abstinent from all tobacco. In one Norwegian study we observed that a significant segment of young snus users had social and demographic characteristics most typical non-tobacco users. However, an equally large segment of snus users had characteristics that typically predispose for smoking, which might indicate that they otherwise would have started to smoke in a situation where snus were unavailable (Larsen et al., 2012).

To estimate the number of new snus users that are needed in order to produce a net loss at the population level, scientists has used a method called risk/use equilibrium (Kozlowski et al., 2001). The method is based on the size of the risk reduction at the individual level by switching from cigarettes to snus (at least 90 per cent). The research that has been carried out so far shows a scenario where the number of new users of snus must come up to completely unrealistic proportions in order to offset the positive effect of each smoker who switches to snus.

For net harm to occur, 14-25 people who have never smoked would need to start using snus to offset the health gain from every new tobacco user who used snus rather than smoking (Gartner et al., 2007). But in Norway, i) smokers, ii) former smokers, and iii) youth who have characteristics that predispose to smoking makes up the majority of the young snus users.

## **CONCLUSIONS**

In Norway, as in Sweden, snus is reported by ever-smokers to be the most preferred method for quitting, and former smokers make up the largest segment of snus users. The quit rate for smoking is consistently observed to be higher for snus users than for smokers who have no experience of use of snus. Moreover, those using snus are more likely to have quit smoking completely or considerably reduced their cigarette smoking, than users of medicinal smoking cessation products. The combination of usage and efficacy suggests a higher level of efficiency of snus than medicinal nicotine as a smoking cessation aid. The increase in snus use among men in Norway has not been paralleled by an increase in dual use of snus and cigarettes. The typical pattern of dual use is daily use of one product paired with occasional use of the other. Cigarette consumption among dual users is 40% lower compared to exclusive smokers, and there is no evidence that dual use lessens plans to quit smoking. Smoking cessation is a widespread motive for additional snus use, supporting a hypothesis that dual use might be regarded as a transient phenomenon – a stepping stone either to exclusive use of snus or preferably freedom from tobacco altogether.

Availability to snus may lead to use among people who would not otherwise have used a tobacco product, or lead to snus use by smokers who would have managed to quit by other means. Any public health impact from this is likely to have been more than offset by the substantial numbers of Norwegian smokers who have switched from cigarettes to snus.

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