

## Original Investigation

# Patterns and behaviors of snus consumption in Sweden

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## Abstract

**Introduction:** Snus is an oral snuff consisting of moist finely ground tobacco which is available in a loose form or with portions of the tobacco sealed in small sachets termed “pouches.” The product has a long history of use in Sweden. Currently, there is very little published information on levels of consumption and usage behaviors for snus in Sweden. The objective of this study was to obtain data on the frequency and duration of loose and pouched snus consumption in Sweden and investigate usage behaviors.

**Methods:** Telephone surveys of snus users randomly selected from telephone directories in all regions of Sweden were conducted in 2007 and 2008. In total, 2,914 respondents answered questions on snus usage, including the types of products used and the quantity and frequency of use.

**Results:** The majority of respondents (96%) used either pouched or loose snus alone. A minority (12.6%) reported dual use of smokeless and combustible tobacco products. Average daily consumption was 11–12 g for pouched snus and 29–32 g for loose snus. The typical duration of use of each pouch/portion was 60–70 min.

**Discussion:** This survey has provided new insights into contemporary snus use in Sweden, such as the marked differences in daily consumption between loose and pouched snus, length of time that snus users typically keep pouches in the mouth, differential patterns of use in males and females, and the simultaneous use of multiple pouches in a small proportion of users.

## Introduction

Snus is an oral moist snuff consisting of finely ground tobacco, water, salt, humectants, and flavors as the main ingredients. It is

a traditional product with a long history of use in Sweden dating back several hundred years. Snus is principally available in two forms in Sweden: a loose form of compacted tobacco and a form with portions of the tobacco sealed in small sachets termed “pouches” which has been available since the 1970s. Each pouch contains a specific weight of tobacco, which can range from approximately 0.3 to 2.0 g depending on the product. The incidence of tobacco use among males in Sweden is similar to that in most other European countries, but smoking rates are relatively low, as many men prefer to use snus. Swedish men have the lowest percentage of male deaths related to smoking of all developed countries (Peto, Lopez, Boreham, & Thun, 2003). This is reportedly due to snus being a less harmful alternative to cigarettes (Foulds, Ramström, Burke, & Fagerström, 2003).

While the incidence of snus use in Sweden is well documented (currently 24% in males and 3% in females; Statistics Sweden [English] Living Conditions, 2007), there is very little published information on levels of consumption and usage behaviors either in Sweden or for other comparable smokeless tobacco products in other countries. According to a report by the European Network for Smoking Prevention, the average Swedish snuff user consumes about 19 g of snuff per day and uses snuff for approximately 11–14 hr/day (European Network for Smoking Prevention, 2003). Typical usage has also been described as: 14.4 and 20.8 g/day for users of pouched and loose snus, respectively, with total daily usage times of 13.1 (pouched) and 12.3 hr (loose; Andersson, Bjornberg, & Curvall, 1994). Hatsukami et al. have reported consumption data for users of a U.S. moist snuff product, a loose tobacco similar but not identical to Swedish snus (Hatsukami, Gust, & Keenan, 1987; Hatsukami, Keenan, & Anton, 1988). For example, they recruited a small sample ( $n=56$ ) of male adults in the United States aged 18–30 years who were regular users of moist snuff and recorded the number of times they used the product each day (dips per day), plus the duration and amount of tobacco taken for each dip (Hatsukami et al., 1988). The study reported mean weight per dip of 1.97 g of tobacco and 39.9 min duration. The mean

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number of dips per day was 6.3, giving an average dose of 12.4 g and an average duration of use per day of 4.2 hr. The study revealed a high level of behavioral variability among respondents.

Given the lack of detailed data on current snus consumption patterns, we commissioned questionnaire surveys of adult snus users in Sweden in 2007 and 2008 to obtain data on the frequency and duration of consumption of loose and pouched snus and investigate behaviors associated with use. These surveys have provided new insights into consumer behavior and usage patterns for loose and pouched snus in Sweden.

## Methods

### Survey

Snus consumption patterns and usage behavior were investigated by a telephone survey of Swedish snus consumers conducted between March and April 2007 by the market research agency GfK Sverige AB. No rewards or incentives were given for participation in the survey. Individuals were selected at random from telephone directories covering all regions of Sweden. The survey was designed to be geographically representative; the regional weighting of those contacted reflected the relative population of each region to the whole population of Sweden.

The survey was conducted in three stages as described below. Details of subject numbers are provided in Supplementary Table 1. In the first stage of the survey, a total of 63,707 people were contacted, 12,306 declined to participate or failed to complete the survey, and 48,398 were rejected on the basis of the inclusion/exclusion criteria. The inclusion criteria were that the subjects normally used at least one snus portion per day and were aged between 18 and 72 years. Any that worked in journalism, public relations, market research, advertising, or sale and manufacture of tobacco products were excluded. A total of 3,003 people completed the first stage of the survey. The agency verified the consistency of participant responses by reinterviewing a randomly chosen subset of approximately 10% of the survey respondents to guarantee the reliability of the survey data.

The survey consisted of 54 questions covering various aspects of snus usage. Consumption patterns were assessed by questions examining the types of products used, the proportion of respondents using multiple products, and the quantity and frequency of use. Usage behavior was assessed by questions examining the time of use, the position in mouth, and tendency to move product during use. A number of questions were included in the survey to check the quality of responses from participants.

Respondents who provided incomplete sets of answers at this stage ( $n=20$ ) or provided conflicting answers to the survey's quality check questions ( $n=69$ ) were also removed from the dataset. After these adjustments, the number of respondents was reduced to 2,914, consisting of 2,555 males and 359 females.

This first stage of the survey did not provide sufficient insight into the time of snus use. A large percentage of respondents were found to use the product for more than 35 min, but all usage times greater than this time period were simply recorded in the questionnaire as more than 35 min rather than a specific estimated time. Therefore, two follow-up questionnaires

were conducted, each focusing exclusively on either pouched or loose snus users (second and third stages of the survey), to provide more accurate information on time of use. The follow-up questionnaires took place in August 2007 and September 2008 and used subsets of the original respondents, who were reinterviewed using the same procedures (including data consistency checks) as the original survey. The pouched user follow-up survey of August 2007 returned valid datasets for 1,019 users of pouched snus, and the loose user follow-up survey of September 2008 returned valid datasets for 381 loose snus users, following consistency and quality checks in both cases (Supplementary Table 1).

### Quantity of snus used per day

This study relied on self-reported information which may be subject to a degree of inaccuracy due to imprecise reporting of regular habits or, for instance, an inability of loose snus users to report typical weights for their tobacco portions. From the survey data, two methods were available to estimate daily consumption. The first approach was to question the respondents about the number of packages (e.g., tins, cans) used per day, together with the identity of their main brand. Package weights (and portion sizes for pouched snus brands) were identified for each of the main brands reported by the respondents. The daily consumption (grams per day) was then calculated for both types of snus as follows:

$$\text{Daily consumption} = \text{number of packages per day} \times \text{snus weight in package.}$$

The second approach was to question the respondents on the identity of the main brand they used and the number of pouches or portions of loose snus taken per day. Loose snus users were also asked to estimate the number of portions they take from a package of loose snus. From this information, the consumption (g/day) could be calculated as follows for both types of snus:

$$\text{Daily consumption} = \text{number of portions per day} \times \text{portion weight.}$$

For pouched snus, the portion weight was that printed on the package of each respondent's main brand. For loose snus, portion weight was calculated from the total weight of tobacco in a package divided by the number of reported portions per package.

### Statistical analysis

Statistical analysis of the datasets, including descriptive statistics, frequency counts, and nonparametric significance tests, was conducted using Minitab software Version 15.1 and SAS v. 9.1 (Cary, NC).

## Results

### Demographics of snus usage in Sweden

Snus use is reportedly far more common in the male population in Sweden compared with the female population (male to female ratio: ~ 8:1) (Statistics Sweden [English] Living Conditions, 2007). This was reflected in the lower number of females ( $n=359$ ) compared with males ( $n=2,555$ ) who completed our

questionnaire (male to female ratio: ~ 7:1). The product use distributions of the respondents in the survey, their use of different snus styles, and detailed demographic data (age and gender) for the survey respondents are provided in Table 1. The age distribution of the survey respondents was compared with that of the Swedish population in 2007 ([http://www.scb.se/statistik/\\_publikationer/BE0101\\_2007A01\\_BR\\_00\\_BE0108TAB.pdf](http://www.scb.se/statistik/_publikationer/BE0101_2007A01_BR_00_BE0108TAB.pdf)).

The age distribution of all snus users in the study (defined in this survey as those who normally use at least one snus portion per day) was similar to the national age distribution, with no significant differences in the mean and median age of the survey respondents and general population. However, there was a slightly greater proportion of 30–55 year olds in the survey in comparison with the Swedish population in general. When comparing pouch and loose snus users across the age distribution, approximately 50% of the pouched snus users and approximately 70% of the loose snus users were aged between 30 and 54 years. The distribution shows that the percentage of loose snus users between 18 and 29 years old was lower compared with the pouch users (11.5% compared with 23.6%, respectively).

The female snus users in the survey showed a clear preference for use of pouched snus; very few females (<8%) in the study used loose or both styles (Table 1). Male respondents, however, were more evenly distributed between pouched and loose, with a small majority (54%) using pouched snus. The data also show significant polarization in type of snus use, with few respondents (3.5%) regularly using both types of product (Table 1).

Due to the small number of survey respondents who used both types of snus, the analyses reported in the rest of this report are for sole-loose or sole-pouched snus users only.

## Patterns of tobacco use among daily snus users

The incidence of sole snus use was compared with the concurrent use of other tobacco products by daily snus users (Supplementary Table 2). The data showed limited use of other tobacco products by survey respondents. Only 12.8% of all consumers of pouched or loose snus used other tobacco products, and very little concurrent use of snus with the other smokeless tobacco product, chewing tobacco, was reported in the survey (Supplementary Table 2). A total of 12.6% of the respondents used snus daily and one or more types of combustible smoking article on a daily or occasional basis (Supplementary Table 2). Cigarettes were the major co-used tobacco product, with 9.8% of the respondents also smoking cigarettes. A slightly higher incidence of cigarette smoking was reported among pouched snus users (10.5%) in comparison with loose users (8.7%). Frequency of cigarette use among daily snus users was also investigated; all daily snus users who also smoked reported doing so at least once per week, and 53.5% of them did so daily. Few differences in tobacco product use behaviors were observed across genders or snus type, although no female respondents reported concurrent use of snus with cigars, pipe, or chewing tobacco.

Several styles of pouch are available on the Swedish market. For example, they differ in size and weight (“Mini” pouches with a pouch weight ~ 0.4 g, “Large (Normal)” pouches of 0.8–1 g, and “Maxi” pouches of between 1.5 and 2 g) and also in moisture content, which typically ranges from 25% to 50% of product weight. Mini pouches tend to contain tobacco with lower moisture content than the larger pouches. The survey respondents had a general preference for the Large (Normal) pouches; this preference was different for female respondents, who showed greater use of Mini pouches (38.4% of female respondents in comparison with 6.5% of males; Supplementary Table 3). There

**Table 1. Age and gender distribution of snus users**

	All snus			Pouched			Loose			Both		
	All	Male	Female	All	Male	Female	All	Male	Female	All	Male	Female
N	2,914 <sup>a</sup>	2,555	359	1,713	1,380	333	1,098	1,075	23	103	100	3
Gender distribution, %	100	87.7	12.3	100.0	80.6	19.4	100.0	97.9	2.1	100.0	97.1	2.9
Product distribution												
All users, %	100			58.8			37.7			3.5		
All males, %		100			54.0			42.1			3.9	
All females, %			100			92.8			6.4			0.8
Age, years	Respondents, %											
18–19	3.8	3.8	3.6	5.0	5.3	3.9	1.6	1.7	0.0	6.8	7.0	0.0
20–24	7.3	6.8	10.6	9.3	8.8	11.4	3.8	3.9	0.0	10.7	11.0	0.0
25–29	8.3	7.9	11.4	9.3	8.6	12.3	6.1	6.2	0.0	14.6	15.0	0.0
30–34	10.7	10.7	10.6	10.6	10.4	11.4	11.2	11.4	0.0	5.8	6.0	0.0
35–39	12.5	12.8	10.3	10.0	10.3	9.0	15.9	15.5	30.4	17.5	18.0	0.0
40–44	13.1	12.8	15.6	10.2	9.1	14.4	17.6	17.3	30.4	15.5	15.0	33.3
45–49	11.1	11.0	12.0	9.1	8.4	12.0	14.8	14.9	8.7	5.8	5.0	33.3
50–54	10.4	10.5	10.0	10.6	10.9	9.6	10.1	10.1	17.4	10.7	11.0	0.0
55–59	8.2	8.4	5.8	8.3	8.8	5.8	8.1	8.1	8.7	6.7	7.0	0.0
60–64	7.8	8.1	5.9	9.1	9.9	6.0	6.2	6.3	0.0	3.9	3.0	33.3
65–69	4.9	5.3	2.5	6.0	6.8	2.4	3.7	3.7	4.4	1.0	1.0	0.0
70–72	1.9	1.9	1.7	2.5	2.7	1.8	0.9	0.9	0.0	1.0	1.0	0.0

Note. <sup>a</sup>All respondents, first stage of the survey.

**Table 2. Daily consumption**

		All	Male	Female
<b>Pouched Snus</b>				
Packages per day	<i>M ± SD (Mdn)</i>	0.53 ± 0.3 (0.5)	0.54 ± 0.3 (0.5)	0.49 ± 0.2 (0.5)
Portions per day	<i>M ± SD (Mdn)</i>	11.7 ± 6.5 (10.0)	12.0 ± 6.6 (10.0)	10.4 ± 5.6 (10.0)
Consumption per day (g) calculated from packages	<i>M ± SD (Mdn)</i>	11.8 ± 7.2 (12.0)	12.4 ± 7.2 (12.0)	9.3 ± 6.6 (7.2)
Consumption per day (g) calculated from portions	<i>M ± SD (Mdn)</i>	11.1 ± 7.0 (10.0)	11.8 ± 7.0 (10.0)	8.5 ± 6.2 (7.0)
N		1,713 <sup>a</sup>	1,380	333
<b>Loose snus</b>				
Packages per day	<i>M ± SD (Mdn)</i>	0.59 ± 0.3 (0.5)	0.59 ± 0.3 (0.5)	0.58 ± 0.3 (0.5)
Portions per day	<i>M ± SD (Mdn)</i>	12.3 ± 6.6 (10.0)	12.3 ± 6.6 (10.0)	13.5 ± 7.0 (12.0)
Consumption per day (g) calculated from packages	<i>M ± SD (Mdn)</i>	29.3 ± 16.4 (25.0)	29.3 ± 16.5 (25.0)	29.0 ± 14.2 (25.0)
Consumption per day (g) calculated from portions	<i>M ± SD (Mdn)</i>	32.1 ± 22.7 (25.0)	32.1 ± 22.7 (25.0)	33.8 ± 21.8 (30.0)
N		1,098 <sup>a</sup>	1,075	23

Note. <sup>a</sup>All respondents for pouched or loose snus, first stage of the survey.

are also different pouch color types, the main styles being brown and white, which can result from different processing practices during the manufacture of the products. The brown pouch products tend to have higher moisture content than the white ones due to the spraying of water during pouching. This extra process step for brown pouch products turns the pouch material from the standard white color to a brown color, which is due to staining from the tobacco. Pouch products with different pouch material colors—for example, black—are also available. Supplementary Table 3 shows that 60.7% of male respondents used brown pouches, whereas 65.4% of females used white pouches.

The majority of pouched snus users in the survey (89.2%) normally used only one pouch at a time. However, the remainder (10.8%) reported regular use of two or more pouches simultaneously. The percentage of males and females using one to four portions concurrently is reported in Supplementary Table 4. There was no observed trend between the pouch size and the number of pouches used concurrently, when taking into account the variation in the survey population numbers across the different pouch sizes (data not shown).

### Quantity of snus used per day

The calculation for quantity of snus used per day described in the Methods section relied upon the frequent use by respondents of their main brand. In support of this, the majority

(95.9%) of respondents reported using their main brand ≥50% of the time, 80.9% reported using their main brand ≥75% or more of the time, and 61.2% estimated that they used their main brand almost all the time.

The consumption results from the calculations are summarized in Table 2. Full statistical analyses are provided in Supplementary Tables 5–7. The consumption data were not normally distributed but appeared to be composed of a complex series of different distributions. Nevertheless, the consumption estimates obtained by the two different calculations were in very good agreement. On average, users of pouched snus consumed approximately 11–12 g/day (mean of 11.8 g/day when calculated from packages and 11.1 g/day when calculated from portions; Table 2). By comparison, significantly higher levels of loose snus consumption were observed because the portion weights were in the order of three times greater than for pouched snus; the mean consumption of loose snus was 29.3 g/day when calculated from packages and 32.1 g/day when calculated from portions (Table 2). This difference was primarily due to the larger portion size of loose snus, as the numbers of packages or portions per day were very similar for loose and pouched snus.

The survey data also showed significantly higher consumption of pouched snus by male respondents compared with females (*p* < .001); females tended to use smaller numbers of pouches and smaller sized pouches, as discussed above (Table 2). The data for

**Table 3. Length of time snus is normally kept in the mouth during use**

		Pouched snus			Loose snus		
		All	Male	Female	All	Male	Female
Shortest time (min)	<i>M ± SD (Mdn)</i>	31.7 ± 31.6 (25)	34.2 ± 33.2 (30)	21.7 ± 21.6 (15)	35.7 ± 31.0 (30)	36.1 ± 31.2 (30)	20.6 ± 16.3 (15)
Average time (min)	<i>M ± SD (Mdn)</i>	65.2 ± 49.8 (60)	69.7 ± 51.8 (60)	47.3 ± 35.0 (35)	69.2 ± 41.4 (60)	69.6 ± 41.6 (60)	56.1 ± 27.1 (60)
Longest time (min)	<i>M ± SD (Mdn)</i>	115.9 ± 88.6 (90)	123.8 ± 91.8 (120)	83.7 ± 64.6 (60)	121.1 ± 72.0 (120)	121.7 ± 72.1 (120)	97.8 ± 68.9 (60)
N		1,019 <sup>a</sup>	818	201	381 <sup>b</sup>	372	9

Note. <sup>a</sup>All respondents, second stage of the survey (recontacted users of pouched snus).

<sup>b</sup>All respondents, third stage of the survey (recontacted users of loose snus).

**Table 4. Total time of daily snus use**

	Pouched snus			Loose snus			Reported % of day using snus
	Calculated time per day using snus (hours)			Calculated time per day using snus (hours)			
	All	Male	Female	All	Male	Female	All
<i>M</i> ± <i>SD</i>	12.0 ± 10.4	13.0 ± 10.9	7.7 ± 5.9	12.7 ± 7.4	12.7 ± 7.3	14.6 ± 11.0	66.6 ± 23.0
<i>Mdn</i>	10.0	10.0	6.0	10.5	10.5	13.3	70.0
<i>N</i>	1,019 <sup>a</sup>	818	201	381 <sup>b</sup>	372	9	381

Note. <sup>a</sup>All respondents, second stage of the survey (recontacted users of pouched snus).

<sup>b</sup>All respondents, third stage of the survey (recontacted users of loose snus).

male and female loose snus users were very similar, albeit with a very small number of female respondents in this group (Table 2).

### Normal usage time

Exposure time may be an important parameter influencing intake of constituents from snus. In the first stage of the survey, the respondents were asked how long, on average, they kept their portion in their mouth. Responses were limited to seven time categories ranging from less than 5 min to more than 35 min. However, it was found that the majority of respondents used the products for more than 35 min and, due to the limited scope of this question, the actual usage times of over 35 min were not specified. Therefore, the survey was repeated with subsets of the original pouched and loose snus user survey population (second and third stages of the survey, respectively, Supplementary Table 1). These later stages examined usage time by querying the shortest, average, and longest times that portions and pouches were normally kept in the mouth during use. In each case, the respondents were asked to state the exact time in minutes. There were insufficient completed questionnaires from female loose snus users in the third stage of the survey to provide robust data for this group. Values reported by the survey respondents were found to be nonuniformly distributed, clustering around certain time intervals—for example, 30, 45, 60, 90 min.

Table 3 shows that, on average, the normal time that respondents kept either a loose portion or a pouch in their mouths was slightly in excess of 1 hr. Full statistical analyses are provided in Supplementary Table 8. Female pouched snus respondents tended to use snus for shorter times ( $p < .01$ ), with a mean time in mouth of 47 min. The shortest normal time of use was just over 20 min for female respondents and just over 30 min for male respondents. Examination of the data for the longest time normally kept in mouth shows some extreme values, with male pouched snus users reporting times in mouth of up to 15 hr, and 7 hr for female pouched snus users.

The third-stage, loose snus survey investigated the total fraction of the day during which the product is used (Table 4). Loose snus respondents reported using snus for most of the day (percentage of day:  $M = 66.6\%$ ,  $Mdn = 70\%$ ). These data are open to some degree of interpretation as to whether the respondents provided an answer which was a percentage of the day that they were awake or the total 24 hr day. To examine this more closely, the total length of daily use time was estimated from the average normal use time per portion and the reported number of portions per day. These estimates also indicated that snus use occurs for a significant proportion of the day, with a mean value of 12–12.5 hr and a median

value of 10–10.5 hr (Table 4). These estimates were consistent with the survey respondents reporting their total usage time as a percentage of the time they are awake; for a 16- to 18-hr time period, this would represent a period of 10–12.5 hr of use per day.

Similar estimates were obtained for users of both loose and pouched snus, but female pouched snus respondents were estimated to use snus for significantly less time per day ( $M \sim 7.5$  hr,  $Mdn$  6 hr). The robustness of the estimation technique was seen to fail (Supplementary Table 9) with those respondents who reported large numbers of portions per day and/or long times of use per portion, where the calculated values exceed the length of a day for these users. Due to the lack of precision in the survey question and the difficulty in obtaining realistic estimates for some survey respondents, the values for total usage time reported from this survey should be regarded as indicative estimates only.

### Location in mouth and portion movement during use

The majority of users of both pouched (96%) and loose snus (99%) placed the portion between the gum and upper lip. Although most snus users maintained the portion at the site of application, a significant number, 36.5% of pouched users and 18.9% of loose users, move the portion around the mouth during use. Very similar patterns of behavior were observed for both male and female users. The greater frequency of portion movement during use with pouched users may be a consequence of the integrity or shape of the pouch facilitating movement or of the relatively smaller size of pouched snus portions. Full data on patterns of behavior for location of the portion in the mouth and incidence of portion movement during use are given in Supplementary Table 10.

## Discussion

The majority (~ 90%) of snus users in this study reported that they did not use any other tobacco products, even on an occasional basis. Respondents who did not use snus at least daily were not included in the survey; consequently, the results may have underestimated multiple tobacco use among snus users in Sweden because, for example, smokers who occasionally used snus were not included in the dataset. Low levels of occasional use among snus users (3% in men and 1% in women) have been reported (Ramström & Foulds, 2006); therefore, it is likely that the underestimation of multiple tobacco use in the present study is small. In support of this, the incidence of dual use is consistent with previous reports of low levels of regular contemporaneous

snus and cigarette use in Sweden. For example, 10% of male and 14% of female snus users in northern Sweden were found to smoke regularly in a study conducted in 1999 (Rodu, Stegmayr, Nasic, & Asplund, 2002). In another Swedish survey, it was observed that 9% of male and 0% of female snus users both smoked and used snus on a daily basis (Ramström & Foulds). Taken together, the combined evidence appears to point toward minor levels of dual use of snus and cigarettes in the Swedish population of snus users. The results of the present study show lower rates of smoking among Swedish snus users than those reported for American moist snuff users; for example, among American snuff users, dual product use has been found to be common, with approximately 40% of some-day snuff users and 20% of everyday snuff users also smoking cigarettes (Tomar, 2002).

According to the data collected in this study, there were differences in usage patterns between pouched and loose snus users. Regular users of pouched snus in Sweden used on average between 11 and 12 g/day. The figures for pouched snus were consistent whether they were taken from self-reported daily usage of individual pouches or calculated from tins per day. By comparison, loose snus users consumed on average approximately 29–32 g/day. The difference in total daily consumption between pouched and loose snus was due to the bigger portion sizes of loose compared with pouched snus; frequency of use was similar for both types of product. The daily consumption data were not inconsistent with the limited amount of existing published information which reports the average consumption of Swedish snus as 19 g/day (product type unspecified; European Network for Smoking Prevention [ENSP], 2003) or 14.4 and 20.8 g/day for users of pouched and loose snus, respectively (Andersson et al., 1994). In contrast to pouched snus, there was very little low level usage for loose snus; very few loose snus users took less than 10 g/day and a significant percentage used 50 g/day, as compared with pouched snus users, where 50% consumed less than 10 g/day. The differences in total daily consumption between pouched and loose snus users observed in this study do not necessarily translate into substantially higher intake of nicotine and other snus constituents for loose snus users. Andersson et al. reported no difference in the 24-hr systemic dose of nicotine and metabolites (as measured by urinary excretion) or in the saliva cotinine levels of loose and pouched snus users. In contrast, in the same study, Andersson et al. reported that loose snus users extracted twice as much nicotine from loose than from pouched snus. Andersson et al. explained the discrepancy between the amount extracted and the actual uptake of nicotine by suggesting that loose users spit or swallow much more saliva than users of portion-bag snus. Clearly, further work is required to understand the extractability and bioavailability of nicotine from different snus styles.

The majority of respondents who said they used pouched snus (89.2%) stated that they used only one snus pouch at a time. The remainder regularly used two or more pouches simultaneously. The mean duration of use was 65.2 min for pouched snus (*Mdn* 60 min) and 69.2 min for loose (*Mdn* 60 min). Therefore, the duration of use was similar for the two types of product. These figures were somewhat higher than expected, as a previous study had reported usage times in the order of 40 min (Hatsukami, Keenan & Anton, 1988). The average duration of use per day was approximately 12–13 hr for loose and pouched snus. This figure is consistent with the Swedish report that states that daily usage for the average snuff dipper is 11–14 hr (ENSP, 2003) and with previously reported

daily usage of 13.1 and 12.3 hr for users of pouched and loose snus, respectively (Andersson et al., 1994), but it is higher than the 4.2 hr that was previously reported for users of smokeless tobacco in the United States (Hatsukami et al., 1988).

The number of females in this study was low, but in line with the relative frequency of snus use in the Swedish population (Statistics Sweden [English] Living Conditions, 2007). Nevertheless, there appeared to be gender differences in snus use. For example, the females in this study had a preference for pouched over loose snus and tended to use Mini pouches. There was no reported concurrent use with cigars, pipes, or chewing tobacco in the female survey population. Females consumed a significantly lower amount of pouched snus per day (8.5–9.3 g in comparison with 11.8–12.4 g for male respondents) due to both smaller numbers and size of pouches. Also, compared with all males, the usage time per pouch and per day for females was shorter on average: 47 min per pouch versus 70 min for all males and 7.7 versus 13 hr/day for males.

In summary, this survey has provided new insights into contemporary consumer behavior and usage patterns for loose and portioned snus in Sweden, such as the marked difference in daily consumption between loose and pouched snus, the length of time that snus users typically keep pouches in the mouth, differential patterns of use in males and females, and the observation of simultaneous use of multiple pouches in a small proportion of the population.

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## Declaration of Interests

None declared.

## Supplementary material

Supplementary Tables 1–10 can be found at *Nicotine and Tobacco Research online* (<http://www.ntr.oxfordjournals.org/>).

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