

ORIGINAL ARTICLE

When do adolescents become smokers?

Annual seven-year population-based follow-up of tobacco habits among 2000 Swedish pupils – an open cohort study

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Abstract

Objective. To follow the development of a class of pupils' tobacco habits for seven years, and to study differences in tobacco use between girls and boys. **Setting.** Kronoberg County in southern Sweden. **Subjects.** All the approximately 2000 pupils were followed from approximately age 12 to approximately age 18. **Design.** Yearly cross-sectional surveys from 1994 to 2000. Each year, the pupils filled in an established tobacco questionnaire. They did it anonymously in the classroom. **Main outcome measures.** Percentage of smokers, number of cigarettes smoked per day, and percentage of pupils using "snus", the Swedish variety of oral moist snuff. **Results.** From grade 6 of compulsory school to grade 12 of upper secondary school, the proportion of daily smokers rose, from 0.2% to 22% for girls and from 0.5% to 14% for boys. Among both genders, the increase occurred mainly between grades 7 and 10, and from grade 10 onwards the daily smokers were the largest group of smokers. Starting from grade 9, boys had higher total tobacco consumption than girls, as a result of their increased use of "snus", and at the end of the study 39% of the boys used tobacco compared with 34% of the girls. **Conclusion.** Studying young people's tobacco habits over time gives an understanding of when preventive measures should be implemented. In order for these to influence attitudes, they should be put in place well before tobacco is introduced.

Key Words: Adolescents, family practice, habits, repeated cross-sectional studies, smoking, snus

Tobacco use is normally established in the teenage years, with the most rapid increase occurring at the age of 14–15 years, and the years between 10 and 13 seem to be a particularly sensitive period to initiate a smoking debut [1]. Daily smoking is associated with initiation of smoking before the age of 15 years [2]. On the other hand, the risk of starting to smoke on a regular basis after the age of 20 is very small [3].

It is indisputable that prevention of tobacco use brings health benefits, but there are also health benefits to be gained from postponing the onset of tobacco use [4]. Previous research has shown that from the experimenting stage of tobacco use to the development of a tobacco addiction requires a mean of 2–3 years [5], but more recent findings suggest

that juveniles may become addicted to tobacco much more quickly [6,7].

The latest WHO study of schoolchildren's health habits from 2001/2002 examined smoking habits in pupils aged 11, 13, and 15 years [8]. Swedish adolescents' smoking habits were among the lowest among the 28 countries included in the study. More girls than boys smoked in Western countries whereas the reverse was true in Eastern Europe.

The Swedish Council for Information on Alcohol and Other Drugs (CAN) conducts national cross-sectional studies on tobacco habits each year in grade 9 and every other year in grade 6 [9]. Since 1970 there has been a substantial reduction in the number of smokers, and in 2005 19% of the boys and 30% of the girls in grade 9 were registered as

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- Among both genders, the main increase in daily smokers occurred between ages 13 and 16. At all ages, the proportion of smokers was higher among girls, but the proportion of tobacco users was higher among boys, due to their frequent use of "snus" (snuff).
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smokers. At the same time, 20% of the boys and 6% of the girls used "snus", the Swedish variety of oral moist snuff. Thus, the proportion of tobacco users was about the same in boys and girls: 28% vs. 31%.

When we began our open cohort study in Kronoberg County in 1994 adolescent tobacco habits had been scarcely investigated in a prospective manner. Therefore the aim of this study was to follow a class of pupils' tobacco habits for seven years in repeated cross-sectional surveys, and to study differences in tobacco use between boys and girls.

Material and methods

Kronoberg County is situated in southern Sweden and has a population of approximately 180 000. Växjö is the largest of the eight municipalities, with just over 77 000 inhabitants.

Study population

Over a seven-year period (1994–2000) an open cohort was followed prospectively using repeated cross-sectional surveys. The first questionnaire was distributed in autumn 1994 to all pupils in grade 6 at all the 80 intermediate-level schools in the county. In 1995, 1996, and 1997, the questionnaire was sent to all 20 upper-level schools, to the pupils who were then in grades 7, 8, and 9, respectively. The same questionnaire survey was conducted in 1998, 1999, and 2000 at all 14 upper secondary schools, distributed to the pupils when they were in forms 1, 2, and 3 (grades 10, 11, and 12), respectively.

In grades 6–9, almost all the pupils were born in 1982. During the three upper secondary school years, the vast majority was born in 1982, while 12.5% were born in 1981 or earlier, and 0.4% were born in 1983. Thus, the majority of pupils were followed from approximately age 12 to approximately age 18.

Implementation

The questionnaire was distributed in a similar manner during each year. At the start of the autumn term, a letter with information concerning the study was sent to the principals and the school nurses. A month later the questionnaires were sent to the school nurses, who gave them to the class teachers for distribution to the pupils, who completed the questionnaires anonymously in the classroom during school hours. The entire class's questionnaires were placed in an envelope, which was sealed and sent to the leader of the study via the school nurse.

The questionnaire items about tobacco habits were the same as in the annual national survey of pupils in grade 9 conducted by CAN [9]. These questions were used on a similar target group and were thus established. Those who stated that they smoked every day or almost every day were grouped together as "daily smokers", and those who stated that they smoked at parties/discos, at weekends, and hardly ever were combined in one group as "occasional smokers".

During the years of compulsory school the response frequency was high, whereas it fell to under 80% during the upper secondary school years (Table I). The distribution and collection of the questionnaires in the upper secondary schools involved a larger number of class teachers, and in grade 12 the study responses of an entire class were left out.

Statistics

EpiInfo was used to calculate relative risk (RR) values with Taylor series 95% confidence intervals (CIs).

Ethics

Before the start of the study, all ethical considerations were discussed and approved by the County Council's local ethics committee. The questionnaire was to be administered totally anonymously in the classroom and no details were to be individual or identifiable in any other way. The design of the questions was such that infringement of personal integrity should be minimal.

Results

Development of smoking habits

At grade 6, 0.2% of the girls (Figure 1) and 0.5% of the boys (Figure 2) stated that they were daily smokers (RR 0.45; 95% CI 0.09–2.30). Then the number of smoking pupils increased throughout the upper level of compulsory school until grade 10 at

Table I. Study population and response frequency in the different years, from 1994 to 2000.

Year (class)	No. of pupils	No. of responders	Response frequency (%)
1994 (grade 6)	2179	2015	92.5
1995 (grade 7)	2186	2034	93.0
1996 (grade 8)	2188	1985	90.7
1997 (grade 9)	2163	1934	89.4
1998 (form 1/grade 10)	2592	2099	80.9
1999 (form 2/grade 11)	2191	1854	84.6
2000 (form 3/grade 12)	2094	1585	75.6

upper secondary school. Among both girls and boys, the greatest increase occurred between grades 7 and 8. In grade 12, significantly more girls (22%) than boys (14%) were daily smokers (RR 1.58; 95% CI 1.27–1.96).

From the start of the study to its end, the total proportion of daily smokers rose from 0.2% to 22% for the girls (RR 107; 95% CI 26.5–428), and from 0.5% to 14% for the boys (RR 30.2; 95% CI 12.4–73.6) (see Figures 1 and 2). From grade 10 onwards, the daily smokers became the largest group of smokers. The proportion of never-smokers decreased from 71% to 24% for the girls (RR 0.33; 95% CI 0.29–0.38), and from 56% to 26% for the boys (RR 0.47; 95% CI 0.42–0.54).

Of those born before 1982, 40% were smoking in grade 10 compared with 22% of those born in 1982 (RR 1.79; 95% CI 1.52–2.11).

Amount of cigarettes smoked

The differences between the genders in cigarette consumption per day were not great, although the smoking girls seemed to consume more cigarettes during the years in upper secondary school (Figures 3 and 4). In grade 12, just over one-third of the smoking pupils smoked six cigarettes a day or more.

“Snus” – Swedish oral moist snuff

Among the girls, 1% used “snus” in grade 9 and 2% in grade 12 (RR 1.65; 95% CI 0.76–3.58). More boys used “snus”, and they started earlier; 6% in grade 8 increasing to 26% in grade 12 (RR 4.25; 95% CI 3.27–5.51). In grade 12, significantly more boys (26%) than girls (2%) used “snus” (RR 13.8; 95% CI 8.26–23.1), although 35% of both boys and girls stated that they had experimented with “snus”.

Total tobacco consumption

Starting from grade 9, boys had higher total tobacco consumption than girls, as a result of the increased use of “snus”. During the last year of the study, 39% of the boys used tobacco compared with 34% of the girls (RR 1.13; 95% CI 0.99–1.29), and 12% of boys both smoked and used “snus” compared with only 1% of the girls (RR 11.7; 95% CI 5.71–23.9).

Future smoking habits

When asked whether or not they regarded themselves as smokers at the age of 20, the smokers became increasingly convinced, with increasing age, that they would continue being smokers. In grade 12, just over one-third of both boys and girls believed that they would continue to be smokers.

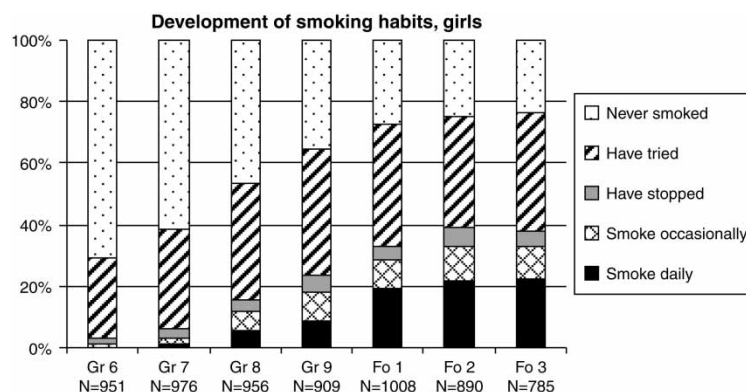


Figure 1. Development of smoking habits for girls, from grade 6 to form 3 of upper secondary school.

Note: The internal dropout varied between two and four during the seven years.

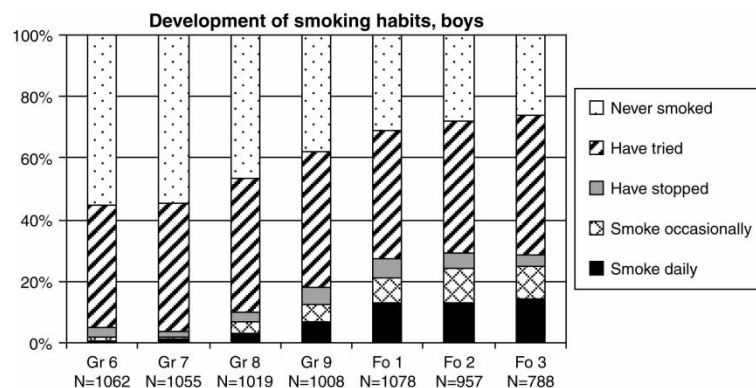


Figure 2. Development of smoking habits for boys, from grade 6 to form 3 of upper secondary school.

Note: The internal dropout varied between two and 12 during the seven years.

In all the years, however, 20% of the girls and 30% of the boys who smoked did not believe that they would remain smokers (RR 0.67; 95% CI 0.49–0.92).

Those who had only experimented with smoking and those who had never smoked became increasingly certain, the older they became, that they would not be smokers at the age of 20. In grade 12, almost all believed that they would continue to be non-smokers, with no difference between boys and girls.

Family smoking

Youths who had a family member who smoked were more likely to begin smoking than youths who did not have a smoker in the family. Of those smoking in grade 7, 75% had at least one other smoking family member, while among non-smoking youths the corresponding figure was 40% (RR 1.76; 95% CI 1.48–2.08); six years later the proportion of smoking family members was 52% and 32%, respectively (RR 1.65; 95% CI 1.44–1.89).

Reason for not smoking

During the three years of upper secondary school, the pupils were asked to provide the most important reason for not starting to smoke or for giving up smoking. In both groups, it was mainly for health reasons (30% of the smokers vs. 35% of the non-smokers, in grade 12), followed by financial reasons (17% vs. 14%). Non-smokers also considered smoking pointless and disgusting (12%), while smokers thought of, for instance, the risk of impaired fitness (4%) as a reason for giving up smoking.

Discussion

Summary of main findings

From grade 6 of compulsory school to grade 12 of upper secondary school, the proportion of daily smokers rose, from 0.2% to 22% for girls and from 0.5% to 14% for boys. Among both genders, the increase occurred mainly between grades 7 and 10, and from grade 10 onwards the daily smokers were the largest group of smokers. Starting from grade 9,

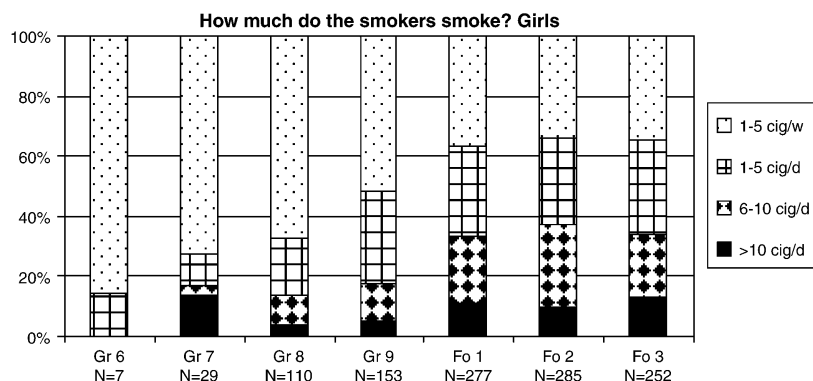


Figure 3. Development of cigarette consumption for the smoking girls, from grade 6 to form 3 of upper secondary school.

Note: The internal dropout varied between two and 12 during the seven years.

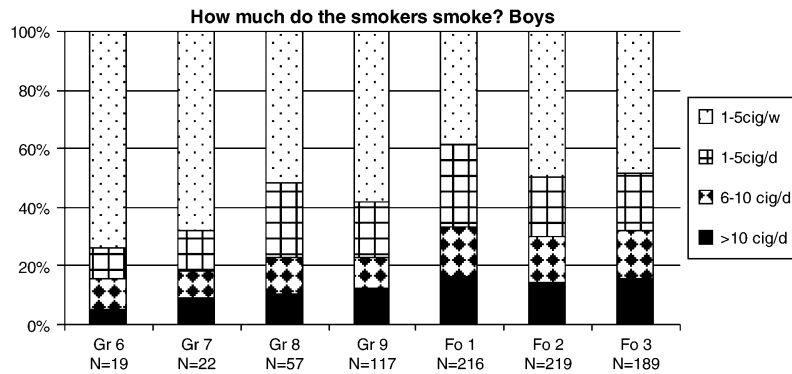


Figure 4. Development of cigarette consumption for the smoking boys, from grade 6 to form 3 of upper secondary school. Note: The internal dropout varied between two and 15 during the seven years

boys had higher total tobacco consumption than girls, as a result of their increased use of “snus”, and at the end of the study 39% of the boys used tobacco compared with 34% of the girls.

Strengths and limitations of the present study

The strengths of our study lie in the large population-based sample of pupils and the limited number of non-responders. Some pupils were absent from school when the questionnaires were administered, but only a few questionnaires were incorrectly completed. The questions regarding tobacco habits were the same as those used by CAN since 1983 for a comparable target group [9].

In another CAN study [10], the pupils who were absent at the time of the study were given the opportunity to complete the questionnaire when they returned to school, and the effect on the results was estimated to be only 1–2 percentage points. Although no similar follow-up of the non-responders was done in our study, it is not likely that the non-responses have affected our results to any noticeable extent.

A significant methodological problem concerns whether or not the pupils provided truthful answers. However, earlier studies suggest that the proportion of incorrect reporting is low, especially if the participants are anonymous [11,12]. Our study was thus administered in total anonymity.

The study was conducted as repeated cross-sectional surveys, which naturally implies certain disadvantages. Thus, it might have been better if individual pupils could have been followed prospectively. However, this would have entailed other problems, such as increased costs, ethical issues, a lower response frequency, and probably a lower degree of veracity in the responses.

Comparison with existing literature

Tobacco habits differ significantly when our findings from Kronoberg County are compared with those from the whole of Sweden [9]. Thus, in our study 18% of the girls and 12% of the boys in grade 9 smoked (daily or occasionally), compared with 25% and 17%, respectively, in the whole country. One explanation is that Kronoberg County is also slightly under the national average for smoking habits in the adult population [13]. Further, we found that more boys than girls used “snus”; in grade 9 the figures were 13% and 1%, respectively, which may be compared with the national figures of 21% and 3%, respectively [9]. Another Swedish study [14] also showed that more girls than boys smoke (in grades 7 and 8), and that boys use “snus” earlier than girls.

Our study, like others, shows that pupils who smoke more often have another smoker in the family [15]. There are studies showing that even in the upper teens young people want parents to try to convince them not to start smoking [16]. It is not just the parents’ tobacco habits that exert an influence; their attitudes affect children’s smoking habit just as much [17,18]. The risk of starting to smoke increases if one of the parents smokes, yet the effect of the parents’ own behaviour is reduced if they nevertheless express a highly negative attitude to their children’s smoking [19]. It is therefore extremely important that parents are involved in tobacco-preventive work, where their role is greater than they may believe, regardless of whether or not they are smokers.

During their upper secondary school years, the pupils were asked to provide reasons why they had not started to smoke, or for giving up smoking. In the open responses, health reasons dominated among both smokers and non-smokers over all three

years. This result was surprising, since the harmful effects of tobacco are not immediately perceived in the teenage years. In an earlier Swedish study, the price of cigarettes was found to be the most important reason for smokers to decide to stop smoking [20], while in our study health reasons were most important, followed by financial reasons.

Implications for preventive practice

The practical value of this study is that it demonstrates where the main increase in tobacco use occurs. Thus, it gives an idea of when to start tobacco-preventive work geared to adolescents, parents, school staff, primary care personnel, etc. To be effective, the measures should be initiated well before the start of tobacco use, and it is important that the methods are adapted to the young. Gender differences should also be taken into consideration to achieve the desired results. Thus, this is yet another important preventive task for the general practitioner and his/her staff [21–26], whether working in clinical practice, or in maternal/child/school healthcare.

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