

## RESEARCH PAPER

## Tobacco use among Swedish schoolchildren

B Rodu, S Nasic, P Cole

*Tobacco Control* 2005;14:405–408. doi: 10.1136/tc.2005.011429

See end of article for authors' affiliations

Correspondence to:  
Dr Brad Rodu, 529 S.  
Jackson Street, University  
of Louisville, Louisville KY  
41202, USA; brad.rodu@  
louisville.eduReceived 2 February 2005  
Accepted 2 July 2005**Objective:** To study the prevalence of snus use and of smoking among Swedish schoolchildren from 1989 to 2003.**Design:** Surveys conducted by the Swedish Council for Information on Alcohol and Other Drugs.**Setting:** All of Sweden.**Subjects:** 84 472 boys and girls age 15–16 years.**Main outcome measures:** Subjects are classified as non-smokers, occasional smokers, and regular smokers, and into three similar categories for snus use. Tobacco use is reported as sex specific prevalence.**Results:** During the period 1989 to 2003, the prevalence of tobacco use declined both among boys and girls. For boys, regular smoking declined after 1992 from 10% to 4%. Their snus use was about 10% in the 1990s but increased to 13% by 2003. Regular smoking among girls was 20% in early years and declined to 15%. Smoking among girls was always double that among boys. Patterns of occasional tobacco use were similar to those of regular use.**Conclusions:** The high prevalence of snus use in Sweden not only reduces smoking rates among Swedish men, but suppresses smoking among boys as well.

For 50 years Sweden has had the lowest prevalence of smoking, and the lowest incidence of smoking related diseases, in the developed world, but these observations are strongly sex specific.<sup>1</sup> Smoking prevalence among women in Sweden follows that of European women in general, and they have similar mortality rates for smoking related diseases.<sup>2</sup> In contrast, Swedish men smoke—and consequently die—at about only half the rate of men in all other European Union (EU) countries.<sup>2</sup> The low smoking rates of men are strongly associated with their high prevalence of use of smokeless tobacco (snus, or Swedish moist snuff). For example, a recent report showed that only 11% of men in northern Sweden smoke while 27% use snus.<sup>3</sup>

The favourable effect of snus on smoking rates is now of widespread interest because the sale of smokeless tobacco products is prohibited everywhere in the EU except Sweden. In fact, a prominent group of European tobacco research and policy experts argues strongly that smokeless tobacco products should be available throughout the EU.<sup>4</sup> Others contend that the ban should remain in place. The major argument for continuing the ban is that the widespread availability of smokeless tobacco in Europe may lead to tobacco initiation among adolescents, eventually resulting in higher smoking rates.<sup>5</sup>

Statistics on tobacco use among Swedish schoolchildren have been collected for many years by the Swedish Council for Information on Alcohol and Other Drugs (Centralförbundet för alkohol-och narkotikaupplysning, CAN).<sup>6</sup> This study uses this information to describe patterns of tobacco use among schoolchildren in Sweden.

## METHODS

CAN conducts annual surveys of alcohol, tobacco and drug use among Swedish schoolchildren, using annual school registration data to ensure that each year's survey sample is nationally representative.<sup>6</sup> CAN files contain detailed information concerning smoking and snus use among samples of 15–16 year old Swedish schoolchildren during the years 1989 to 2003.

We defined three categories of adolescents with regard to their smoking: non-smokers, occasional smokers, and regular

smokers; and three similar categories for snus use. An occasional smoker is a subject who smoked on weekends, at parties, or seldom; a regular smoker is a subject who smoked daily or almost daily. Information on the frequency of snus use (daily, weekends, etc) was not gathered by CAN until 1997, but consumption data (boxes per week) was available for all years. After analysis of responses for snus frequency and amount over the 1998–2003 period, we defined an occasional user as a subject who used less than one box per week, and a regular user as a subject who used one or more boxes of snus per week. We combined the three categories of smokers and snus users into nine mutually exclusive categories (for example, a regular smoker who is not a snus user, a regular smoker who is an occasional snus user, etc).

Tobacco use is reported as sex specific prevalence and is divided into regular use and occasional use. For clarity, we report the prevalence of three categories of regular tobacco use: regular smoking (with no or occasional snus use), regular snus use (with no or occasional smoking), and regular combined use (both products). Similarly, we report the prevalence of three categories of occasional tobacco use: occasional smoking, occasional snus use, and occasional combined use.

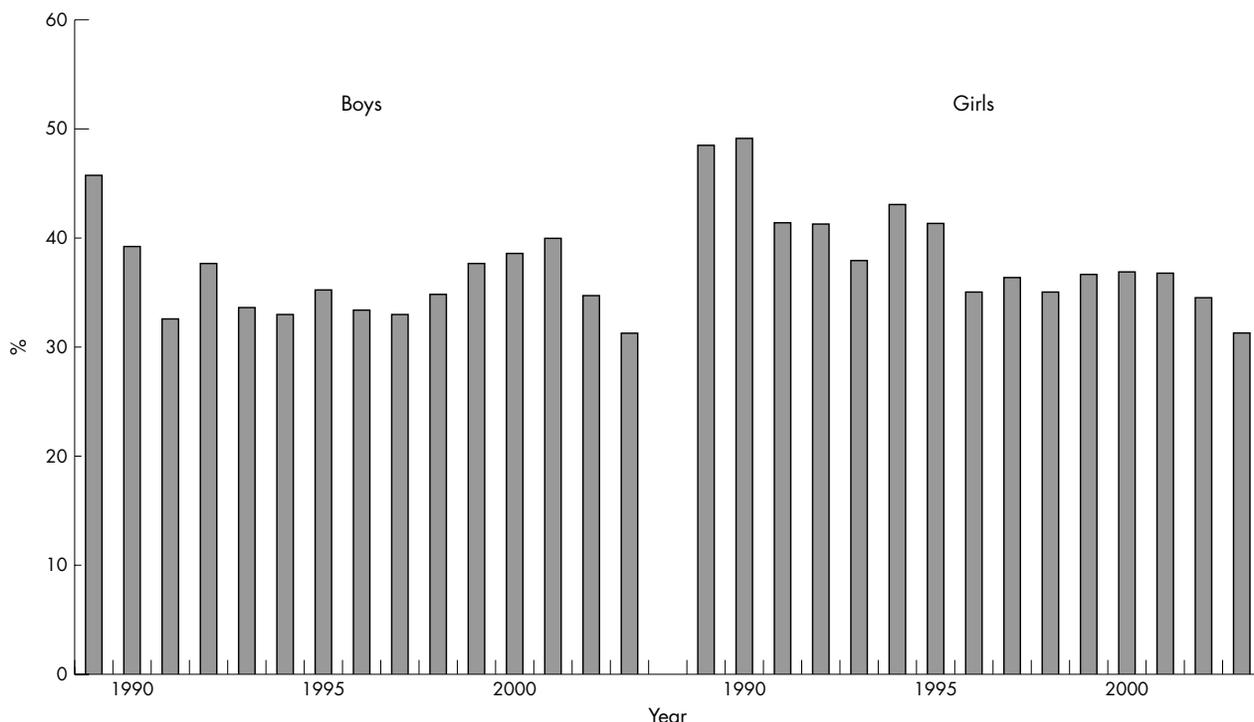
CAN reported that a change in the survey instrument in 1997 resulted in a higher prevalence of smoking during and after that year. However, both the old and new surveys were used in 1997. We estimated the difference in prevalence (for all tobacco use categories) that resulted from the two sets of survey instruments in that year and expressed these differences as adjustment factors. The prevalence data from 1998 to 2003 was adjusted to provide comparability to survey years from 1989 to 1997.

This study was reviewed by the institutional review board at the University of Alabama at Birmingham and assigned exempt status.

## RESULTS

A total of 84 472 survey responses were collected for the 15 year study period, 51% from boys and 49% from girls.

Figure 1 shows the prevalence of any tobacco use among boys and among girls. Prevalence declined for both sexes,

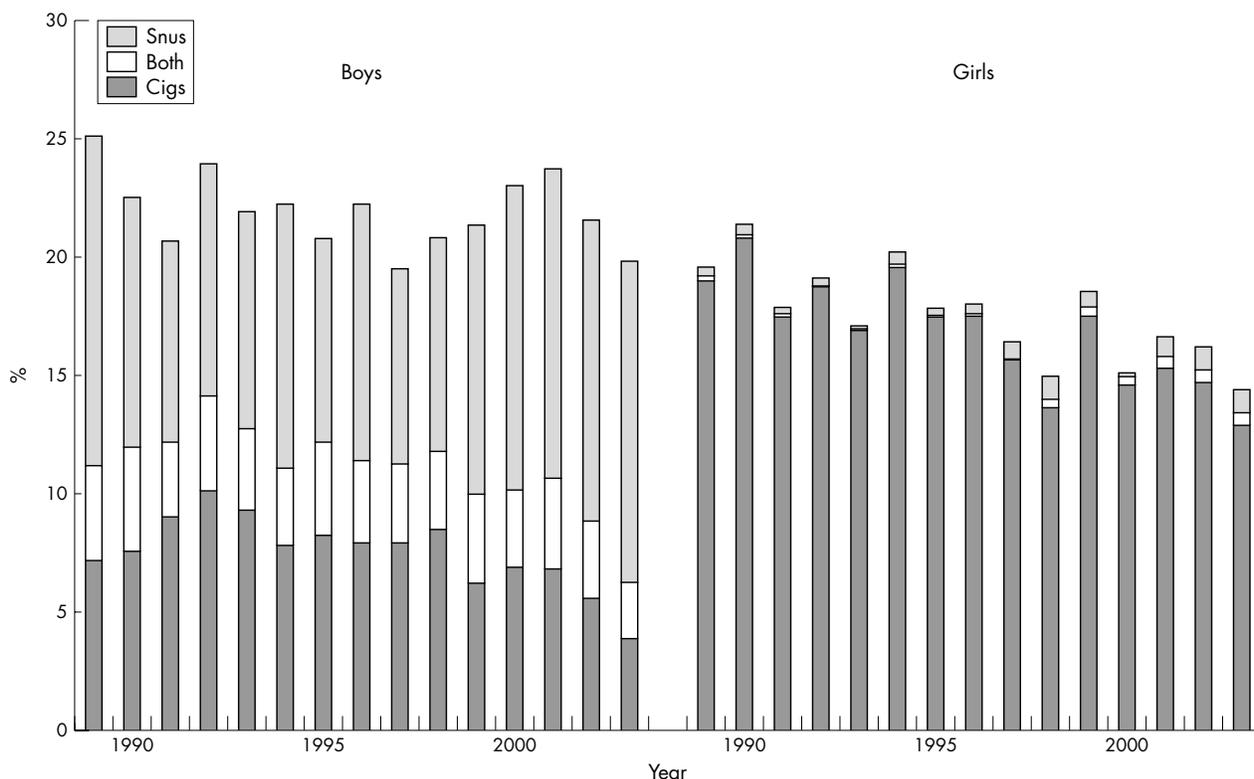


**Figure 1** Prevalence of any tobacco use among boys and girls age 15–16 years in Sweden, 1989–2003.

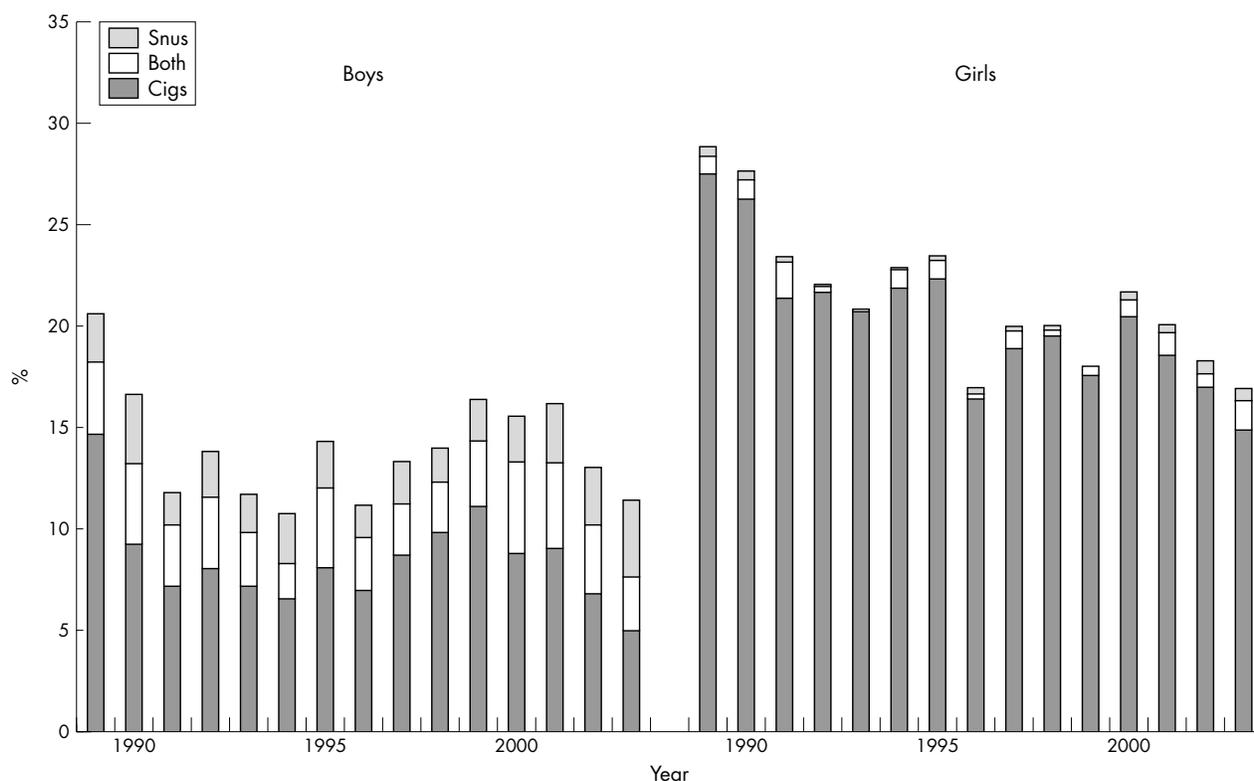
from about 45% to 30–35% over the period. Girls had a somewhat higher prevalence than boys, but this difference was minimal after 1995.

Figure 2 shows the prevalence of regular tobacco use, by type, among boys and among girls. The prevalence among

boys ranged from 20–25% throughout the study period. However, after 1992 the prevalence of regular smoking among boys declined steadily, from 10% in that year to 3.9% in 2003. From 1990 to 1998 the prevalence of snus use averaged 9.5% (range 8–11%), then increased to 13% during



**Figure 2** Prevalence of regular tobacco use, by type, among boys and girls age 15–16 years in Sweden, 1989–2003.



**Figure 3** Prevalence of occasional tobacco use, by type, among boys and girls age 15–16 years in Sweden, 1989–2003.

the 1999–2003 period. The correlation coefficient between regular smoking and regular snus use, over time, was  $-0.73$ . The prevalence of regular combined use was stable at 3–4%.

The prevalence of regular tobacco use among girls, starting around 20% and declining to 15%, was lower than that among boys in each year. The prevalence of regular smoking declined gradually, from almost 20% to about 13%. However, the prevalence of regular smoking among girls was more than double that among boys over the study period (mean 17% *v* 8%,  $p < 0.05$ ). Among girls the prevalence of regular snus use and combined tobacco use (together) always was 1.5% or less.

Figure 3 shows the prevalence of occasional tobacco use, by type, among boys and girls.

The prevalence of occasional tobacco use varied among boys, but generally was 11–16% throughout the study period. This pattern was largely due to changes in occasional smoking, which for most years was 7–10% (mean for all years, 8.5%). The prevalence of occasional snus use was stable and very low (2–3%), as was occasional combined smoking/snus use (around 2–4%).

The prevalence of occasional tobacco use among girls was higher than that among boys for all years, starting close to 30% and declining to about 17%. As with regular smoking, the prevalence of occasional smoking among girls was more than double that among boys during the study period (mean 20% *v* 8.5%,  $p < 0.05$ ). The prevalence of occasional snus use and combined use among girls was low for all years, averaging about 1%.

## DISCUSSION

This study shows that about 20% of Swedish boys use tobacco regularly, as do boys in other European countries.<sup>7</sup> However, specific patterns of tobacco use differ strikingly between Swedish boys and their EU counterparts. For example, in

2003 the prevalence of snus use was 14% and smoking prevalence was 3%. In 2002 the World Health Organization reported that the average prevalence of daily smoking among 15 year old boys in 25 European countries (excluding Sweden) was 18%.<sup>7</sup> In that report boys in Sweden had the lowest smoking prevalence of all countries, at about one third of the EU average (5.7%). The next highest prevalence was in Greece (9.2%). All other countries reported prevalences from 12% (Wales) to 27% (Lithuania). Thus, high prevalence of snus use by Swedish boys may be a factor in low smoking prevalence.

In contrast, smoking rates among 15 year old girls in Sweden do not differ from those among girls in other European countries. In the 2002 WHO report smoking prevalence among Swedish girls was the fifth lowest in

### What this paper adds

It is now generally recognised that snus use is associated with low smoking prevalence in Sweden, especially among men. However, there has been concern that widespread availability of snus may lead to tobacco initiation among youth, eventually resulting in higher smoking rates.

From 1989 to 2003 the prevalence of regular snus use among Swedish boys increased from about 10% to 13%, but the prevalence of regular smoking was very low and declined, from about 10% to under 4%. The prevalence of snus use among girls was very low, but the prevalence of smoking was about double that of boys over the entire period. Thus, snus use does not appear to be a gateway to smoking among Swedish youth, but instead is associated with low smoking prevalence among boys.

Europe (14%), but still close to the average for all other countries (19%, range 11% in Greece to 29% in Germany).

Our study shows that smoking among both Swedish boys and girls has declined gradually over the past 15 years. This also has occurred in most west European countries.<sup>7,8</sup> However, the prevalence of smoking among girls is now higher than that among boys in 18 of 26 European countries, including Sweden. A close look at these differences in smoking rates by sex reveals that smoking rates are about 20% higher among girls than boys in 17 of these countries (range, from 10% higher in Ireland to 80% higher in Wales). In contrast, the prevalence of smoking among girls is almost 2.5 times that of boys in Sweden. In our study this ratio has been below 2.0 only once in the last 10 years, and it reached a high of 3.3 in 2003.

A recent Swedish study showed that parental tobacco use influences tobacco use by children.<sup>9</sup> For example, boys whose father used snus were three times more likely to use snus compared with boys whose fathers were tobacco-free (95% confidence interval (CI) 1.4 to 6.4).<sup>9</sup> Similarly, mothers' smoking was associated with smoking in their children (odds ratio 2.4, 95% CI 1.6 to 3.6). It appears that the high prevalence of snus use in Sweden has played a role not only in reducing smoking rates among Swedish men, but in suppressing smoking rates among boys as well.

#### ACKNOWLEDGEMENTS

We thank officials at CAN for providing the survey data and for assistance with technical questions.

Drs Rodu and Cole are supported in part by an unrestricted gift from the United States Smokeless Tobacco Company to the Tobacco Research Fund of the University of Alabama at Birmingham. The sponsor had no scientific input or other influence in regard to this project, including design, analysis, interpretation or preparation of

the manuscript. The sponsor has no knowledge of this project and has not seen the manuscript.

#### Authors' affiliations

**B Rodu**, Department of Pathology, School of Medicine, University of Alabama at Birmingham, Birmingham, Alabama, USA

**S Nasic**, Department of Medicine, University Hospital, Umeå, Sweden

**P Cole**, Department of Epidemiology, School of Public Health, University of Alabama at Birmingham

Competing interests: None of the authors has any financial or other personal conflict of interest with regard to the sponsor or other commercial interests.

#### REFERENCES

- 1 **LaVecchia C**, Lucchini F, Negri E, *et al*. Trends of cancer mortality in Europe, 1955–1989: II and IV. *Eur J Cancer* 1992;**28**:514–99, **28A**:1210–81.
- 2 **Rodu B**, Cole P. The burden of mortality from smoking: comparing Sweden with other countries in the European Union. *Eur J Epidemiol* 2004;**19**:129–31.
- 3 **Rodu B**, Stegmayr B, Nasic S, *et al*. Impact of smokeless tobacco use on smoking in northern Sweden. *J Int Med* 2002;**252**:398–404.
- 4 **Bates C**, Fagerström K, Jarvis MJ, *et al*. European Union policy on smokeless tobacco: a statement in favour of evidence based regulation for public health. *Tobacco Control* 2003;**12**:360–7.
- 5 **Tomar SL**, Connolly GN, Wilkenfeld J, *et al*. Declining smoking in Sweden: is Swedish Match getting the credit for Swedish tobacco control's efforts? *Tobacco Control* 2003;**12**:368–71.
- 6 **Hvitfeldt T**, Andersson B, Hibell B. Skolevers drogvanor 2003. Centralförbundet för alkohol- och narkotikaupplysning. Rapport Nr 77. Stockholm, 2004. <http://www.can.se/rapport/2004/Rapp77Skol03.pdf>.
- 7 **Currie C**, Roberts C, Morgan A, *et al*. *Young people's health in context. Health behaviour in school-aged children (HBSC) study: international report from the 2001/2002 survey*. Copenhagen, Denmark: World Health Organization, 2004.
- 8 **King A**, Wold B, Tudor-Smith C, *et al*. *The health of youth. 1993–1994 international report*, World Health Organization Regional Publications, 1996, European Series 69.
- 9 **Rosendahl KI**, Galanti MR, Gilljam H, *et al*. Smoking mothers and snuffing fathers: behavioural influences on youth tobacco use in a Swedish cohort. *Tobacco Control* 2003;**12**:74–8.

#### 11th European Forum on Quality Improvement in Health Care

26–28 April 2006, Prague, Czech Republic

For further information please go to: [www.quality.bmj.com](http://www.quality.bmj.com)

Book early to benefit from a discounted delegate rate