LUND UNIVERSITY

Towards a tobacco-free generation. A study on the tobacco habits of adolescents: when, why and who?

Edvardsson, Ingrid

2012

Towards a tobacco-free generation

A study on the tobacco habits of adolescents: when, why and who?

LUNDS UNIVERSITET

Ingrid Aurin Edvardsson

Cover photo Elin Åkesson

Department of Clinical Sciences, Malmö
Faculty of Medicine
Lund University
Sweden

Lund University, Faculty of Medicine Doctoral Dissertation Series 2012:78

ISBN 978-91-87189-41-8

ISSN 1652-8220

Printed by Media-Tryck, Lunds university, Lund 2012

Tabaci fumus, pulvis, pasilli omnes venenati sunt.

Tobaksrök, snus, tuggtobak äro alla giftiga.

Carl von Linné 1733

Table of Content

Table of Content 7

Abstract 9

Sammanfattning 12

List of papers 14

Abbreviations 15

Introduction 17

- Tobacco or health 17
- Tobacco habits among adolescents 21
- Important factors that affect the development of tobacco use 23
- Theoretical base 27
- Prevention 29
- Health promotion 34

Aims 38

- General aim 38
- Specific aims 38

Method 39

- Setting 40
- Design and study population 40
- Definitions 44
- Validity and reliability 45
- Analytical methods 47

Ethical considerations 50

Results and comments 52
Paper I 52
Paper II 54
Paper III 56
Paper IV 60
General discussion 63
Methodological considerations 68
Conclusion 73
Acknowledgement 75
References 77

Abstract

Why adolescents are using tobacco is a large and complex issue. There are factors on society, group and individual levels that affect the youngsters. The norms and attitudes in their surrounding, as well as the tobacco habits of parents and friends, are important when it comes to affecting adolescents to start using tobacco or abstain from it. Counteracting the use of tobacco requires a combination of actions at different levels. Among other things, it is known that it is effective to use various political actions, such as price increases and legislation whereby the age limit for purchase of tobacco is obeyed and more smoke-free environments are created. Offering adult tobacco users tobacco cessation, and thereby reducing the number of tobacco users, is also an investment that has an effect to make fewer adolescents start smoking or using snus.

The overall aim of this dissertation work was to increase the knowledge on adolescent tobacco habits and explore the factors that may be used for health promotion work among adolescents to make them tobacco-free. The thesis consists of four parts, three quantitative studies and one qualitative study. All the studies were carried out among adolescents in the Kronoberg County in southern Sweden.

The first two studies were based on data collection with repeated annual surveys for three and seven years, respectively. The first study made an attempt to evaluate a more simple intervention by A Non Smoking Generation through class visits to pupils in grade 6. A baseline measurement in grade 6 found no significant difference in smoking habits between the intervention group and the comparison group. Two years after the intervention, a new survey was conducted. When the analysis was based on pupil responses from the survey about whether they had been visited by an inspiring person or not, a significant difference in smoking habits was found in favour of the intervention group. But when the analysis was done

as a comparison between schools that the pupil said he/she had attended, and whether these schools had been visited or not, no significant difference was found.

In the second study, a grade of pupils in an open cohort was followed with regard to development of smoking habits and any possible sex differences. The results showed that the largest increase in tobacco use was found between grade 7 (age 13) and upper secondary grade 1 (age 16), but it subsided during the last two upper secondary years. Snus were introduced later than smoking in the adolescents' lives. Girls smoked more than boys, and boys used far more snus than the girls did. From grade 8 (age 14), the boys were at a higher level than the girls, with regard to total tobacco consumption.

In the third study, which was qualitative, adolescents in upper secondary school were interviewed about their use of snus. The snus had an important role in the adolescents' identity and group affiliation. Primarily, it was important to boys, who felt manly when they used snus. The adolescents were not aware that they developed an addiction and did not recognize abstinence symptoms that appeared at an early stage. Suddenly, they had to face the fact that they had become addicted, and then it was difficult to quit.

In the final study, factors associated with being smoke- and/or snus-free were studied using a survey to pupils in grade 2 of upper secondary school. Surrounding people being tobacco-free affected the adolescents to remain tobacco-free. Girls appeared to be more prone than boys to be affected by a smoke free surrounding. Boys were affected by male (father and brother) snus-free role models, while girls were affected by a mother and sister being snus-free.

Today's public health work needs to cover both preventive and health promotion efforts. Interventions at a local level, for example with NSG, are important at an individual level for choosing a tobacco-free life. Development of health promotion work with for example a health promoting-school, a supportive tobacco-free environment, is a good investment for the health of our adolescents. Here, we have the possibility to introduce tobacco-free school hours, i.e. that nobody is using any form of tobacco

during school hours. Then, the adult world really demonstrates that the norm is to be tobacco-free.

Sammanfattning

Varför ungdomar använder tobak är en stor och komplex fråga. Det finns faktorer på samhälls-, grupp- och individnivå som påverkar unga. Omgivningens normer och attityder liksom föräldrars och kompisars tobaksvanor har betydelse och påverkar ungdomar att börja använda tobak eller att avstå. För att motverka tobaksbruk krävs en kombination av åtgärder på olika nivåer. Bland annat vet man att olika politiska åtgärder har effekt såsom prisökningar och lagstiftning där åldersgränsen efterlevs för inköp av tobak samt fler rökfria miljöer. Att erbjuda tobaksavvänjning till vuxna tobaksbrukare, och därmed minska antalet tobaksanvändare, är även en satsning som ger effekt för att ungdomar inte ska börja röka eller snusa.

Det övergripande syftet med avhandlingsarbetet var att öka kunskapen om ungdomars tobaksvanor och att undersöka vilka faktorer som kan vara användbara för hälsofrämjande arbete för tobaksfrihet bland ungdomar. Avhandlingen består av fyra delarbeten, tre kvantitativa och en kvalitativ studie. Samtliga studier är genomförda bland ungdomar i Kronobergs län i södra Sverige.

De två första studierna utgår från en datainsamling med upprepade årliga enkätundersökningar i tre respektive sju år. I den första studien gjordes ett försök att utvärdera en enklare intervention av A Non Smoking Generations klassbesök till elever i årskurs 6. Vid baslinjemätning i årskurs 6 fanns inte någon signifikant skillnad i rökvanor mellan interventionsgruppen och jämförelsegruppen. Två år efter interventionen genomfördes en ny enkätundersökning. När analysen utgick från vad eleven angett i enkäten huruvida de haft besök av inspiratör eller inte fanns en signifikant skillnad avseende rökvanor till interventionsgruppens fördel. Men då analysen genomfördes med en jämförelse mellan de skolor som eleven angett att de gått på, och om dessa skolor haft besök eller inte, kunde inte en signifikant skillnad ses.

I arbete två följdes en årskurs elever i en öppen kohort avseende tobaksvaneutveckling och eventuella skillnader mellan könen. Resultatet visade att mellan årskurs 7 (13 år) och gymnasiets årskurs 1 (16 år) skedde den största ökningen för tobaksbruk för att stabiliseras under de två sista åren på gymnasiet. Snus introducerades senare än rökning i tonåringarnas liv. Flickor rökte mer än pojkar och pojkar snusade betydligt mer än flickor. Från och med årskurs 8 (14 år) låg pojkarna på en högre nivå än flickorna sett till den totala tobakskonsumtionen.

I det tredje arbetet som var kvalitativt, intervjuades gymnasieungdomar om sitt snusbruk. Snuset spelade en viktig roll för ungdomarnas identitet och grupptillhörighet. Framför allt var det viktigt för pojkarna som kände sig manliga då de snusade. Ungdomarna var inte medvetna om att de utvecklade ett beroende och kände inte igen abstinenssymtomen i ett tidigt skede. Plötsligt stod de inför fakta att de blivit beroende och då var det svårt att sluta.

I sista arbetet studerades faktorer som var associerade med rök- respektive snusfrihet med en enkätundersökning till elever i gymnasiets årskurs 2. Omgivningens tobaksfrihet påverkade ungdomarna att förbli tobaksfria. Flickor föreföll vara mer påverkbara av en rökfri omgivning än pojkar. Pojkar påverkades av manliga (pappa och bror) snusfria förebilder medan flickor påverkades av att mamma och syster var snusfria.

Dagens folkhälsoarbete behöver omfatta både preventiva och hälsofrämjande insatser. Interventioner på lokal nivå med till exempel NSG har betydelse på individnivå för att välja ett tobaksfritt liv. En utveckling av ett hälsofrämjande arbete med till exempel hälsofrämjande skola, en stödjande tobaksfri miljö, är en god investering för våra ungdomars hälsa. Här finns möjligheten att införa en tobaksfri skoltid, det vill säga att ingen använder någon form av tobak under skoltid, då visar vuxenvärlden att normen ska vara tobaksfritt.

List of papers

This thesis is based on the following papers referred to in the text by their Roman numerals.

I. Edvardsson I, Håkansson A. Development of schoolchildren's smoking habits. Questionnaire studies in intervention and control groups. *Acta Paediatr 2000;89:1257-61*.

II. Edvardsson I, Lendahls L, Håkansson A. When do adolescents become smokers? Annual seven-years population-based follow-up of tobacco habits among 2000 Swedish pupils – an open cohort study. *Scand. J Prim Health Care 2009;27(1):41-6*

III. Edvardsson I, Troein M, Ejlertsson G, Lendahls L. Snus user identity and addiction. A Swedish focus group study on adolescents. (Submitted).

IV. Edvardsson I, Lendahls L, Andersson T, Ejlertsson G. The social environment is most important for not using snus or smoking among adolescents. (Submitted).

.

Abbreviations

CAN	The Swedish Council for Information on Alcohol and Other Drugs (Centralförbundet för alkohol- och narkotikaupplysning)
CI	Confidence interval
EUHPID	European Community Health Promotion Indication Development
HBSC	Health Behaviour in School-aged Children
NSG	A Non Smoking Generation
OR	Odds ratio
POR	Positive odds ratio
R&D	Unit for Research and Development
RR	Relative risk
SOC	Sense of coherence
TPB	Theory of planned behaviour
WHO	World Health Organization

Introduction

Tobacco or health

Smoking

It has been known for a long time that the use of tobacco is the primary cause of ill-health that could be prevented as well as early death in the world (1). Every second smoker dies early due to smoking, and a smoker dies on average ten years earlier than a non-smoker (2). The first study, which showed strong correlations between smoking and lung cancer, came in 1950 (3). The extent of the health consequences did not become known to the general public until in 1964, when the American Surgeon General issued The Reports of Surgeon General´s on Smoking and Health (4). These reports said that smoking increased the risk of cancer, heart and lung disease, etc. At the time, smoking was widely spread, primarily among men all over the world, in socio-economically favoured groups. When the knowledge on the damaging effects of smoking became known, these groups were the first to acknowledge this information and quit smoking (5). Internationally, the smoking habits have changed, and in the middle of the 1960s, 52 percent of the men and 34 percent of the women in the US were smokers. From then on, smoking has decreased, and in 2010 22 percent of the men and 17 percent of the women in the US were smokers. In Japan, smoking was even more common, and in the middle of the 1960s, 81 percent of the men were smokers, but it was more uncommon among women, 13 percent. In 2010, 38 percent of the Japanese men were smokers, while there was a small decrease among women, as 11 percent were smokers (6). In the middle of the 1960s, every second man and every fourth woman in Sweden was a daily smoker, which nearly 50 years later had decreased to 12 and ten percent, respectively – very low figures from an

international perspective (7). In Sweden, daily smoking is more than five times as common among people with a low-level education, compared to those with a high level. Also, both men and women in blue-collar professions are more likely to be smokers than white-collar professionals. Furthermore, financially poor people are more likely to smoke than people who are financially better off (7).

Each year, thousands of children and adolescents in Sweden start smoking. The earlier one starts smoking, the higher the risk to become addicted to nicotine and develop illnesses due to smoking. Smoking can be a risk factor for lumbar pain among young adults, possibly because the nicotine reduces the blood flow to the muscles and the skeleton (8). The apparent health effect among smoking adolescents is primarily reduced physical fitness, more coughing and phlegm in the respiratory tracts, earlier development of heart and blood vessel disease, poorer development of the lung capacity, and reduced lung function as an adult. There is a correlation between anxiety, depression and smoking among adolescents, but the question is whether mental ill-health increases the risk of smoking or whether smoking increases the risk of mental ill-health. There are studies to support both statements (9). Smokers who quit before age 30 will undo much of the health damage caused by tobacco use (9).

Lung cancer, heart disease, chronic obstructive pulmonary disease, and other major chronic diseases caused by smoking will continue to be leading causes of premature death until the tobacco epidemic is stopped.

Snus

The use of smokeless tobacco is well spread over the world and can be managed in a variety ways. Snus (the Swedish variety of oral moist snuff) is common in Sweden, and using it is mainly a male habit. In Sweden, 18 percent of men and three percent of women were daily users of snus in 2011 (7). It is more common among people with low-level education to use snus on a daily basis, compared to people with medium- or high-level education. The differences between socio-economic groups has decreased somewhat since the end of the 1980s, primarily because the percentage of

snus users has increased more among white-collar than among blue-collar professionals.

The research on the health effects of snus is so far incomplete compared to research on smoking. However, it is known that snus contains more than 3 000 substances, of which at least 28 are cancerous (10). Snus must not be exported to EU member states and Sweden has a permanent exception from the EU prohibition against snus sales. The harmful effects of snus are often compared to those of smoking, but such a comparison is lopsided as very few products are as damaging to the health as cigarettes. The health risks of using snus should be compared to not using any form of tobacco whatsoever. A scientific committee was assigned by the EU commission to investigate the health risks of snus and concluded that snus and similar products cause cancer and addiction. Furthermore, there are no data to support or refute the hypothesis that snus is a useful smoking cessation aid (10).

In Sweden, there have been discussions on whether the use of snus among adolescents increases the risk of starting to smoke later. One study showed that young boys who used snus had an increased risk of becoming dual users. But using snus was not associated with an increased risk of exclusive smoking (11). There is also research that indicates that snus could be a gateway to smoking only for a minority and that using snus is correlated to being a non-smoker or an ex-smoker (12).

Studies have shown that using snus increases the risk of fatal heart attack and fatal stroke, raised blood pressure and changes in the mucus membrane of the mouth, and possible increased risk of pancreas cancer (13-15). There is also research that indicates an increased risk of cancer in the mouth when using snus. During pregnancy, there are some indications that using snus increases the risk of preeclampsia, premature birth, lower birth weight and an increased risk of a stillbirth (16-18). There are also studies showing that using snus increases the risk of diabetes type 2 and a metabolic syndrome (19, 20). A Norwegian study showed that snus users ran a higher risk of damaging muscles and joints during physical training than non-users (21). Correlations have been found for adolescents between snus user and risk-taking behaviour as drug use, drinking and driving, unsafe sex, and school

truancy (22, 23). New studies show an interaction in the brain's rewarding system between nicotine and other drugs. For example, adolescents who use snus are more likely to consume more alcohol than smokers or tobacco-free youngsters (23, 24).

Political support

The first WHO public health convention was the Framework Convention on Tobacco Control, which was adopted in 2003 and ratified by Sweden in 2005. Its purpose was to stimulate all countries in the world to cooperate in protecting future generations from the health, social, financial and environmental damages of tobacco and to stop the tobacco industry's influence on health politics. The tobacco convention, with its 38 articles, includes scientifically based actions necessary for reducing the use of tobacco (25). The convention contains strategies for reducing the demand, access to and availability of tobacco. It also includes actions for adhering to and partly make legislation more stringent with more smoke-free environments and warnings on tobacco packets and control of tobacco sales in the respective countries. Through the convention, Sweden can get both national, regional and local support for the tobacco prevention work at all levels of society.

The overall national public health goal is to create the prerequisites in society for good health on equal terms for the entire population. The tobacco prevention work in Sweden is based on one of the 11 adopted target areas for our public health policy (26). Even if Sweden has come relatively far internationally, a lot of work is still left to reach the four intermediate goals regarding tobacco set for 2014. The work involves actions for prevention of starting to use tobacco, development of support to those who wish to quit using tobacco and increased training of key groups. The four intermediate goals are: a tobacco-free start of life from 2014, halving the number of adolescents under 18 who start smoking or using snus, halving the number of smokers with the highest consumption, and that nobody should be involuntarily exposed to tobacco smoke in his/her environment.

Sweden adopted a Tobacco Act in 1993, which has hence been made more stringent a number of times. The Act includes a decision that nobody should be involuntarily exposed to tobacco smoke and an age limit of 18 for purchase of tobacco. Smoking is also limited in certain outdoor environments, such as school yards. In the spring 2012, the Swedish government gave the National Institute of Public Health the assignment to analyse passive smoking in public places and examine the need for more smoke-free environments.

Tobacco habits among adolescents

International views

The WHO international survey, Health Behaviour in School-aged Children (HBSC), has been conducted every four years since 1985 in Europe and North America with around 40 participating countries. The latest survey in 2009/2010 showed large differences in smoking between the countries (27). The countries with the largest share of 15-year-olds who reported smoking in the last week were Greenland, Lithuania, Austria, Latvia and Croatia. The countries with the smallest share of smoking 15-year-olds were Armenia, Iceland and Canada. Among 15-year-old girls, one percent in Armenia and 61 percent on Greenland reported smoking in the last week. Corresponding results for boys were eight percent in Canada and 53 percent on Greenland. In Sweden, 15 percent of the girls and 13 percent of the boys reported smoking in the last week in this survey (27). More girls than boys were smoking in Western Europe, while the reverse was found in Eastern Europe. The survey does not ask about snus habits or other use of smoke-free tobacco.

Sweden

Since the beginning of the 1970s, Sweden has conducted surveys on tobacco habits. From 1986, the responsibility for these lies with The Swedish Council for Information on Alcohol and Other Drugs (CAN),

which conducts annual surveys on pupils' tobacco habits. In the 1970s, smoking was considerably more common than today, and among ninth-graders (age 15) 41 percent of the boys and 47 percent of the girls reported smoking every day or occasionally in 1971. Since then, the development has varied substantially. Ever since the 1970s, girls have been smoking more than boys, but looking at the total tobacco consumption, smoking and using snus, the boys had the highest rate in the 1980s. The differences have diminished in recent years, and from the early 21st century, the girls have a slightly larger share of the total tobacco consumption.

The share that neither smokes nor uses snus has increased in the last decade, especially among girls. In 2011, 76 percent of the boys and 72 percent of the girls did not use any form of tobacco in ninth grade (age 15) (28). Among the boys, 11 percent only smoked, four percent only used snus, and eight percent both smoked and used snus. Use of tobacco was more common among girls and 23 percent only smoked, one percent only used snus and three percent both smoked and used snus (28). The main increase in tobacco use takes place in secondary and the beginning of upper secondary school (12, 29). There are few studies on adolescents' snus debut, but it appears that snus is introduced later than smoking.

Tobacco use increases with age, and in the second year of upper secondary school (age 17), more than 40 percent reported in 2011 that they smoked and/or used snus, every day or occasionally (28). Among the boys, 16 percent reported that they only smoked, eight percent used snus and 17 percent both smoked and used snus. Smoking was considerably more common among girls at this age, 34 percent, while two percent used snus, and five percent both smoked and used snus. Looking at the total tobacco consumption, there were no major differences between the sexes.

Smoking the waterpipe has become an increasingly common occurrence among adolescents in Sweden. A waterpipe session takes between 20 and 80 minutes, and participants take in high doses of nicotine, carbon monoxide, tar, heavy metals and other cancerous substances. In ninth grade, around 40 percent of the pupils reported that they at some stage had smoked a water pipe (28). Even smoking tobacco that does not contain nicotine

during a water pipe session, the smoke still contains a number of harmful substances.

Important factors that affect the development of tobacco use

The Tobacco industry

The WHO Framework Convention on Tobacco Control contains articles that prohibit all advertising for tobacco and tobacco industry sponsoring of events. Advertising and marketing of tobacco contributes to an increased demand that maintains the social acceptance of tobacco. According to the Swedish tobacco legislation, advertising of tobacco is prohibited, but allowed to a limited extent at points of sales. Marketing of tobacco to indirectly reach adolescents, for example through product placement in films, has become increasingly common. The task of the tobacco companies is to spread the tobacco epidemic, and they primarily direct their marketing towards adolescents (30). By using a variety of marketing strategies, they encourage new, young consumers to try their products and keep using them. They market not only products, but also a lifestyle that attracts young people.

The design of the cigarette packets has been much discussed, as it has been part of the tobacco industry's marketing strategies. The introduction of neutral packets, without a tempting design, is being implemented in an increasing number of countries. This makes smoking look boring and unattractive to adolescents (31). A review report that studied the tobacco convention guidelines regarding neutral cigarette packets showed that neutral packets were perceived as less attractive to both men and women of all ages. The packets give the impression that their contents have low quality, taste worse and seem cheaper than the normal, trademarked cigarettes. Furthermore, younger smokers and non-smokers react more negatively than older smokers to the neutral packets (32).

According to the Swedish National Institute of Public Health Swedish Match had 20 different snus brands in 2002, and six years later they had increased to 180 brands.

Addiction

People who become tobacco users often do this before they leave school and an early smoking debut seems to lead to a strong nicotine addiction, which in turn may lead to an increased risk of continued smoking until late in life (9, 34). Earlier research has claimed that it took relatively long before adolescents developed a nicotine addiction and became daily smokers. To develop into a smoker was previously seen as a multistep process over two three years from never having smoked to becoming a daily smoker (35). More recent research has shown that nicotine addiction develops gradually, and faster than previously believed. Symptoms of nicotine addiction may show up early, already after the first cigarette, and precede the development to both monthly, weekly and daily smoker, but there are individual variations (36). One study showed that a median consumption of two cigarettes per week was enough to show symptoms of nicotine addiction (37). A Swedish study has presented that adolescents who both smoked and used snus reported vastly more symptoms of nicotine addiction than those who only smoked. Furthermore, mixed users had started using tobacco at a lower age than those who only used one tobacco product (38).

Adolescents risk developing an addiction relatively quickly as their brains are still developing. Research has shown that girls develop both more and earlier symptoms of nicotine addiction than boys (37). Adolescents may also have a tendency to "self-medicate" by smoking, as the nicotine has a calming effect that can also reduce lighter symptoms of depression (39, 40).

Adolescents are not aware that the abstinence symptoms they feel may be due to their nicotine addiction. It becomes a vicious circle when the teenager feels a craving for smoking and abstinence symptoms that make them smoke both more often and more, which in turn increases their addiction (41). The first symptoms of nicotine addiction among adolescents

could be the feeling that they have lost their autonomy (39). Even long after a tobacco stop, one may feel a strong craving for nicotine, which could constitute a risk of a relapse.

More recent research indicates that there may be a genetic explanation for certain people getting a "kick" already after the first puff. However, more research and knowledge is needed on how hereditary factors act together with social circumstances and other surrounding factors (42). A hereditary component could probably make it more difficult to quit smoking once one has started smoking (9).

During pregnancy, nicotine is accumulated and may give a higher concentration of nicotine in the fetus than in the smoking woman. Exposure to nicotine may affect the development of the brain of the fetus, thus increasing its vulnerability for nicotine addiction later in life (43). Teenage girls whose mothers smoked during pregnancy are smokers to a greater extent than their peers whose mothers did not smoke during pregnancy (44).

Parents

As a tobacco user, one is a tobacco-using role model. There is a correlation between parental smoking habits and their children's proneness to start smoking, and they smoke more and more often develop into daily smokers (45, 46). A teenager with two smoking parents runs a nearly three times larger risk of starting to smoke compared to a peer whose parents do not smoke (47). Several studies have showed that mothers have a stronger influence than fathers on whether the children start smoking or not, and that snus-using fathers influence their sons to start using snus (48, 49). Even smoking parents could influence their children not to start smoking by using an active and structured discussion guide (50). If tobacco is available to the adolescents at home, it makes it easier for them to start smoking (51).

Teenagers have high expectations on the parents to react to their use of tobacco. In a Swedish study, 94 percent of the adolescents felt that the parents should persuade their children not to smoke, and 59 percent felt they should prohibit their children to smoke (52). Parents who are smokers

themselves can halve the risk that their children start smoking by showing a clear negative attitude to smoking (53). Parents do not only affect their children's tobacco habits by their own tobacco habits and attitudes, but the attachment and their concern may have a protective effect (54). Being manipulative, strict and too controlling turned out to have no effect in preventing children from smoking.

Individual predictors

The use of tobacco is most often part of a larger problem complex among adolescents. In comparison to non-smoking adolescents, health problems and other risk factors of ill-health among tobacco-using friends are more common (55-57): poor results in school (9, 57), drinking to get drunk (58), drug abuse (59), and rebellious behaviour and taking risks (60), are examples of factors related to smoking during adolescence. Mental ill-health, such as depression (40), and social anxiety (61) also affect the development into becoming a smoker.

Health inequalities

Health inequalities in adult life are partly determined by early life conditions. It is well known that health and health-related behaviour differ between socio-economic groups (62). Smoking is most often done in a social context, and it is presently seen as a socio-economic marker in the western world, and increasing attention is paid to socio-economic differences between adults. Smokers often live in more socially pressurized conditions. Already in the 1960s, Hilary Graham highlighted the importance of placing health problems into a social context and trying to understand what the everyday life looks like for people whose behaviour is seen as problematic (63). The study showed that smoking was a coping strategy, a way to handle the everyday toil to bring your life together. Health behaviour is linked to the total life situation. The decision to smoke is a choice, but it is not made on the basis of ignorance or carelessness. Differences in health promotion habits and behaviour should be seen as a

result of different life conditions and the access to different forms of resources, and not as evidence of omissions by individual people.

Social context

Smoking appears in a social context where a person is part of a group of friends and is affected by them. Adolescents value friendship very highly and are eager to fit in with a group, and they are strongly affected by the group members. Adolescents select friends with similar attitudes and behaviour as themselves regarding smoking (64). It has also been demonstrated that having a smoking sibling more than doubles the risk of starting to smoke compared to those who have non-smoking siblings (47).

The idea that there are lots of people who smoke is in itself a risk factor for adolescent smoking. If a large part of the pupils think that smokers are a majority, this can create a negative spiral resulting in more smoking pupils (35). Adolescents in their early teens seem to overestimate the norm for smoking and adjust their own use after how they interpret the norm. By revealing the so-called majority misunderstanding among younger adolescents, one can correct false ideas of the number of peers who are using tobacco or think it is tough to smoke (65). They may wish to blend in with the group and perhaps look older than they are.

When smoking is seen as a social norm in certain circumstances, among those who are seen as cool, rebellious, sophisticated or full of vitality, other teenagers respond to them by copying their behaviour and start smoking.

Theoretical base

Social identity

Our social identity emanates from the groups that we are part of. According to Tajfel and Turner's theory, the social identity is formed through categorization, identification and social comparison (66). By categorizing and dividing people, groups and cultures into a few categories, we can

group ourselves into hierarchies on the basis of how we perceive that we are seen by others. We achieve identification when we reason about ourselves in relationship to others, that we are part of a specific group, for example a profession or a nationality. We also make a social comparison where we compare ourselves with others and thereby create a social identity. The groups with which we identify ourselves are seen to be more positive than other, more distant groups (67). If the groups have high status, the individual also gets high status. This will result in us overrating the value of the group to which we belong and belittle other groups. The social identity also strengthens the personal identity.

Adolescence is a time when you "become somebody" and develop in a social context. Adolescence is a time full of complex and contradictive feelings. Smoking can be a way to handle vulnerability, and starting to smoke or use snus could be part of the youngster's life when seeking to find his/her identity. To experiment with tobacco is a common part of many teenagers' life, but everyone does not get addicted. The group of friends has an important role in a young person's life, and group norms, attitudes and behaviour have a larger impact on the youth than those of the parents (68). Several studies show that youngsters' perception of their friends and their own social identity is related to their use of tobacco (69).

Theory of Planned Behaviour

Several theories attempt to understand the relationship between health, disease and behavioural choices and to explain the link. According to Ajzen's Theory of Planned Behaviour (TPB), there are three assumptions that control the human behaviour; behavioural beliefs, norms, and control beliefs (70). Attitudes, subjective norms and perceived control of the behaviour is what forms the intention, our willingness to act, which in turn guides the behaviour. A person's intention to act in a certain way depends on his/her attitude to the behaviour and the norms in the social context and in society. The subjective norm can be seen as a combination of perceived expectations from other people and the willingness to live up to these expectations. This theory can be applied to studies of adolescents' relationships to the use of tobacco. In one study, the positive attitude of the friends

and the subjective norms towards being smoke-free, were related to the probability of remaining smoke-free (71).

The social situation affects the norm, for example that it is more appropriate to smoke in certain environments. The view on smoking in the Swedish society has changed gradually throughout the years. From the norm that the smoker had a right to smoke, it is now the non-smoker's right not to have to be subjected to passive smoking. If the norm is to be tobacco-free, a person who uses tobacco is an exception. TPB has been updated into the Integrated Model of Behaviour change (IMBC). The focus of the model is a person's intention to perform a specific behaviour (the "target behaviour") as both a dependent variable and a predictor of behaviour (72). Behavioural beliefs lead to attitudes, intentions and finally behaviour.

Prevention

Prevention efforts must focus on adolescents, because nearly 90 percent of adult smokers begin smoking before 18 years of age (9). Effective intervention that combines media campaigns, price increases, school-based policies and programs as well as changes in national policies and norms are effective in reducing the initiation, prevalence and intensity of smoking adolescents. No specific effort or activity can solve the tobacco problem on its own, but it is the combination of different investments that are the most successful (9, 73).

Society level

Availability

According to the World Bank, tobacco availability is one of the most important factors for the development of tobacco consumption among adolescents (74). Many countries have an age limit for the purchase of tobacco. Since 1997, Swedish legislation prohibits sale of tobacco to people under 18. To make the purchase of tobacco more difficult is an action

aiming to reduce the adolescents' access to tobacco, but also a way to increase the understanding among adults of the value of preventing youngsters from buying tobacco (75). If the observance of the age limit is to have an effect on the adolescents' tobacco habits, shopkeepers must follow the law to at least 80 – 90 percent (76). This means that eight youngsters out of ten should be denied purchasing tobacco. An age limit with a high observance rate can facilitate that youngsters cannot experiment with tobacco, and it also strengthens the norms in society against the use of tobacco (77). However, it is not difficult to get hold of tobacco even if you are under 18. Most common among both smokers and snus users is to be treated by a friend (28). Despite the age limit, around 35 percent of smoking adolescents in grade 9 (age 15) were able to buy cigarettes themselves (28). A Swedish study showed that a majority of the population was positive to actions that limit and prevent the use of tobacco. In one study, 59 percent of smoking adolescents considered it good to have an age limit for the purchase of tobacco (78). With tobacco-free zones around schools, i.e. that tobacco is not sold near them, another study showed that tobacco use among pupils in these schools went down (9).

Price influence

The most effective action to reduce tobacco consumption is to raise the price on tobacco, report WHO and the World Bank (74, 79). According to estimations, a ten percent price increase on cigarettes would result in a drop in consumption of around four percent among adults. Adolescents are price sensitive, and the price is a factor that can both prevent them from starting to use tobacco and make them quit smoking/using snus. There is a clear correlation between adolescents' smoking and the price level (80). For young people, a twice as large effect of price increases on tobacco can be expected, compared to the effect among adults. (74, 81).

Smokefree environment

A totally tobacco-free environment makes it easier for children/youngsters never to start smoking and reduces the risk of relapses among those who

have quit, plus that nobody is exposed to passive smoking. It has been shown that prohibiting smoking indoors in public places is effective for reducing smoking in the population and de-normalizing smoking (82).

An increasing number of countries in the world imposes legislation and regulations for more smoke-free public places. In Europe, Ireland was followed by Norway and Malta as the first countries to introduce smoke-free restaurants. In Sweden, a number of public places became smoke-free in 1993 when the country introduced a Tobacco Act. Since 1994, it is not allowed to smoke in school yards, and legislation was further tightened in 2005 with demands for smoke-free restaurants. An increasing number of municipalities and county councils in Sweden are also introducing smoke-free, or tobacco-free, work hours for the employees, even though this is not covered in the legislation. But the requirements for smoke-free school yards are not adhered to, and 79 percent of the pupils in a Swedish study (2009) reported that smoking occurred in school yards (78). In total, nearly 80 percent of the adolescents said that both pupils and staff should be tobacco-free during school hours. Active supervision, including checking school yards, and actions against pupils who violate the prohibition, reduce the use of tobacco among adolescents (83). More legally sanctioned smoke-free outdoor environments have yet to be implemented in Sweden.

Local and individual level

Prevention and health promotion in schools

The preventive work in schools has had a different approach and development in the last decades. In the 1960s, there was a model with health belief and information deficit. If adequate information shows that smoking causes serious harm to the body, adolescents would dissuade from smoking. Later on, in the beginning of 1970s, the model focused on social competence. Cigarette smoking was associated with negative or antisocial behaviour patterns, decreased levels of perceived self-worth and poor attitudes towards family, school and community. The last model by the end of 1990s was a social influence model. Peer smoking, smoking by others in the

immediate social environment and other social and psychological factors are associated with smoking initiation. At this time, it was important to develop social skills to resist direct and indirect social influences that encourage smoking (9, 84). School-based programs, with comprehensive strategies, are more effective when they combine other initiatives such as mass media campaigns, family programs and smoke-free policies for the community or the state (85). Studies have shown that social influence programs where they practiced resistance against peer pressure, has positive effects on adolescents' tobacco habits (9, 86). Psychosocial programs and strategies, particularly if they are interactive, for example with chances of communication among participants and providing an opportunity for the exchange of ideas, role playing and the practice of new skills are based on the social influence approach (educating youth about social norms and influences, and providing skills for resisting such influences) can be effective in preventing the onset of smoking (9). However, there is a lack of school-based smoking prevention programs with long-term follow-up evaluation.

If the school has an adopted policy, it affects the pupils' tobacco habits. A policy shows that the tobacco issue has priority and makes it obvious also for the adults in the school that they are role models for the pupils and that it is important if adult smoking is visible for the pupils. One study showed that schools with a policy, which covers the smoking habits of both pupils and staff, reported that ten percent of the pupils were daily smokers, compared to schools with no policy, where 30 percent said they were daily smokers (87). One of the most effective actions in schools is to have a stringent policy, with which the adults in the school work actively and do follow-ups (88). A tobacco policy affects the social environment in the school by establishing norms and creating social acceptance for the implemented guidelines on the use of tobacco.

From a public health perspective, it is desirable that the school works to contribute to improved health among adolescents, both from a short-term and long-term perspective, with the purpose of promoting health and have no tolerance for tobacco use. Smoke-free environments contribute to

reduced smoking. Therefore, the work with smoke-free school yards, or rather tobacco-free school hours, is of great importance (83, 89).

In Sweden, the National Institute of Public Health has developed a national strategy that includes nine areas regarding the school's role and mission for tobacco-preventive work in the school environment. The strategy emphasizes the importance of a common approach and cooperation, as well as offering tobacco cessation. The need for adult presence and the importance of information, knowledge and competence are also deemed very important (90).

A Non Smoking Generation

A Non Smoking Generation (NSG) is a Swedish non-profit organization, with no affiliation to any political parties or religious denominations, working to inform and inspire young people never to start using tobacco. Since its foundation in 1979, the NSG vision has been constantly developed and now includes activities such as altering public opinion by running campaigns, taking part in media debates and lobbying key decision makers. NSG trains young people in their early twenties (“inspirers”) to visit schools and talk about influence, respect, knowledge and peer pressure. The theory behind this is that if children understand the importance of making their own decisions rather than going with the crowd, they have come a long way towards living a life free from tobacco.

It is far more common that adults wish to quit smoking/using snus than adolescents expressing this desire. In a Swedish study from 2009, 37 percent of the young smokers (around 70 percent of adult smokers) said they wished to quit smoking, which is a decrease among the adolescents since the 2003 study whilst 48 percent wished to quit smoking (78, 91). Among the snus users, 15 percent of the adolescents (around 35-40 percent of adult snus users) said they wished to quit. In different studies, the adolescents have responded to the question of what could make them quit smoking (29, 78). The primary reasons given were health and economy, which however does not necessarily mean that these reasons actually influence their behaviour. The reasons for wishing to give up snus were

mainly that it was expensive and that their boyfriend/ girlfriend did not want them to use snus (78). Only a few methods for tobacco cessation have been developed for adolescents, and most often the same methods are thus used for adolescents and adults. The few existing studies show very minor effects (92), which indicates that it is a difficult area that needs further development and research.

Health promotion

From the Ottawa Charter for Health promotion in 1986, health is seen as "a resource for everyday life, and not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities" (93). This is a holistic approach where health is affected by social, economic and cultural circumstances. The conference in Ottawa has been ground breaking for the health promotion development. One of five key action areas was creating supportive environments (94). One of these, schools, can promote the health and welfare of children and young people and have a long tradition with school health service.

The definition *'Health promotion is the process of enabling people to increase control over, and improve their health'* is from the Ottawa charter (93). Tannahill and Downie have developed a model describing the health promotion content (95). The three main parts are health education, health protection and prevention, and they must all be coordinated. Health education means to increase the knowledge and create changes of the individual's attitudes to promote well-being and health. It could, for example, be to strengthen the children's and adolescents' self-esteem. Health protection involves different measures at community level with the objective to promote the health of the population, for example the establishing of a tobacco policy. Prevention has a pathogenic base and contains, for example, tobacco cessation. All these parts interact with each other.

The European Community Health Promotion Indication Development (EUHPID) consortium has developed a model to compare health promotion

and prevention in public health work in relation to health development (96). The health promotion perspective has a salutogenic approach, and it supports health development by increasing resources, which allow better maintenance and enhancement of positive health. Prevention of ill health starts with risk factors for health and health development.

The salutogenic approach seeks to explain factors that contribute to maintaining good health. Antonovsky´s studies explain how the experience and the sense of coherence can explain the relationship between life stress and health status for the individual person (97). Comprehensibility, manage-ability and meaningfulness are the three components that lead to a Sense of Coherence (SOC) and that are considered positively related to health. Antonovsky was striving to develop theories that focused on the conditions for health. It is important to identify, further and safeguard salutogenic factors that further health for all groups.

Healthy environments are vital, and there is a potential for health promotion in different areas like schools and families. In a healthy social environment, a strong social network gives opportunities to handle daily life demands (93).

Schools are important arenas for health promotion because of the possibility of targeting all children. A health-promoting school was defined by WHO 1995 as "one in which all members of the school community work together to provide pupils with integrated, positive experiences and structures which promote health. This includes both the formal and informal appropriate health services and the involvement of the family and the wider community in efforts to promote health.*"*(94). The school setting provides an opportunity to communicate with young people and provides learning opportunities and a safe environment to practice new skills. During all years in school is also the time when adolescents create and develop their health behaviour that becomes habits and attitudes for a lifetime. The health effects of tobacco use cannot be seen immediately, they appear later in life. A Swedish study showed that the responsibility for promoting a tobacco free generation is like a cat-on-the-rat-game. The adolescents put the responsibility on the parents, while the parents put it on the school and the school and the school staff on special health educators (98). Education,

doing well in school furthers the development of competences that in themselves promote health. There are also studies that demonstrate that doing well in school protects against the use of tobacco (99).

This thesis does not have the ambition to be comprehensive but will still demonstrate the complex connection between factors and circumstances that influence a tobacco-free person to become a person addicted to tobacco (figure 1). In conclusion, there are several different factors deciding the development of tobacco use, partly consisting of individual factors such as sex, genetic disposition and attitudes to tobacco, and partly of surrounding factors such as social environment, parents' smoking habits, school climate and norms in the society. This demands supporting actions and relationships that can affect the social acceptance and the society's norms for a tobacco-free life. The challenge lies in finding new methods and strategies to reach the smokers in the least favoured socio-economical groups.

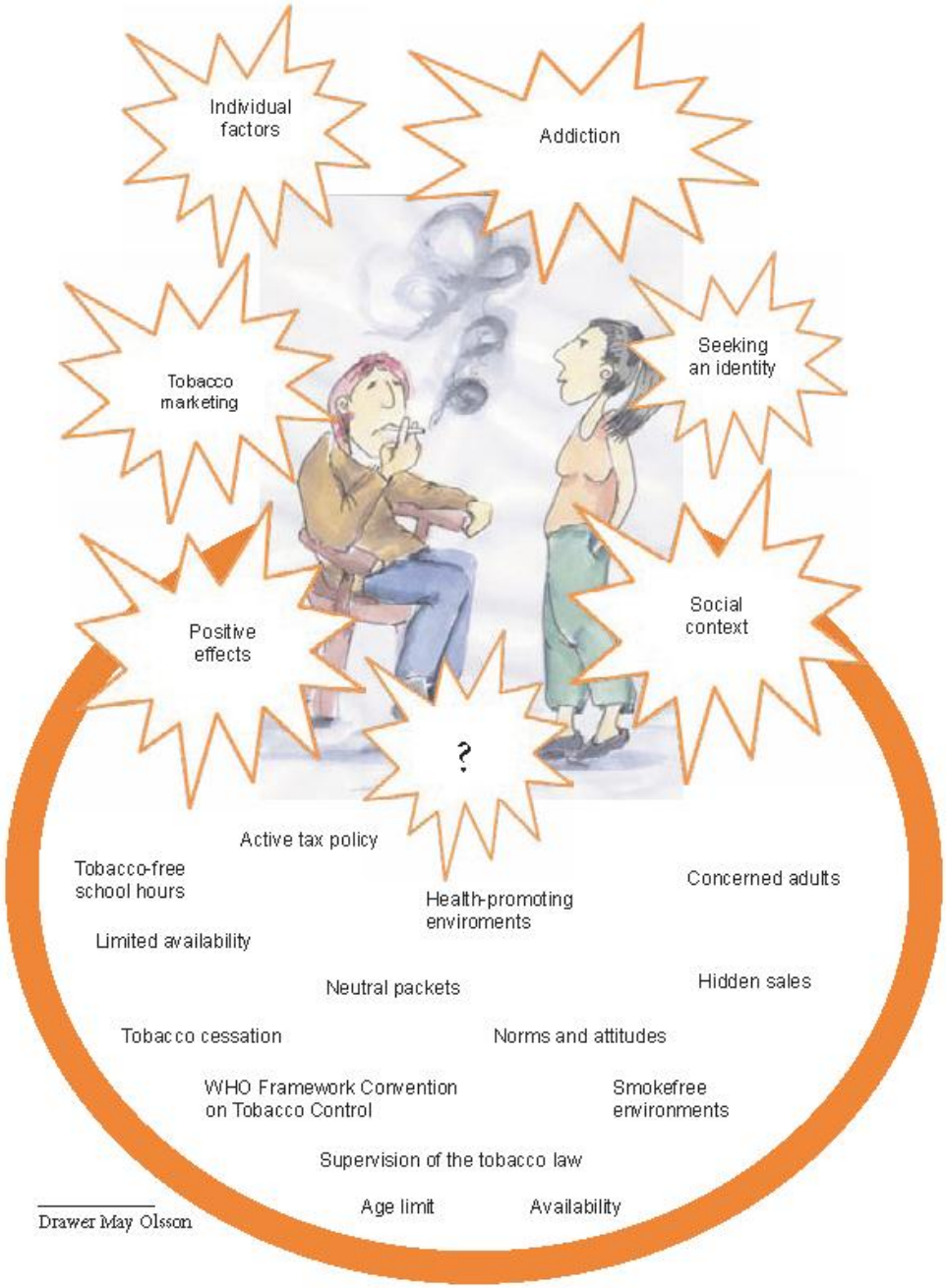

Figure 1. Illustration of impact factors for start using tobacco among adolescents and a platform with examples of preventive and promoting interventions for being tobacco free

Aims

General aim

The general aim of this thesis was to increase the knowledge about adolescents' tobacco habits and to explore determinants useful for formulating health promotion activities among adolescents.

Specific aims

Paper I: To follow the development of smoking habits in a youth cohort from sixth to eighth grade, for girls and boys, and to study any effects of a simple anti-smoking intervention carried out in sixth grade.

Paper II: 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.

Paper III: To explore the significance of using snus for adolescents, and attitudes to snus, as well as the reasons why they began using snus and what maintained and facilitated the use of snus.

Paper IV: To identify factors, which were related to being smoke-free and snus-free, respectively, among adolescents in relation to adolescents who were smoking and/or using snus, and determine if there were any sex differences.

Method

For a widened perspective on the area of adolescents and tobacco habits, this thesis contains three quantitative studies and one qualitative study. The quantitative surveys were done in the classroom environment and the qualitative study consisted of focus group interviews done in schools.

The first study was initiated to get an idea of when adolescents started to smoke and whether a simple intervention had an effect on the adolescents' tobacco habits. An age level of pupils was followed for three years with the aim of getting guidance on when it may be suitable to make an intervention. Study II was a further development of the first survey, and for another year, the pupils completed surveys on their tobacco habits. The aim of this was to expand the knowledge of the population and the development of smokers and snus users, respectively, as well as sex differences.

An inductive, qualitative design was chosen to explore adolescents' views of themselves as snus users, and the third study was a focus group interview. This method is particularly useful for determining people's perceptions, experiences, attitudes and behaviour, thoughts and feelings about a problem or an issue (100). The purpose of conducting focus group studies is to listen and gather opinions. The questions are regarded fully predetermined and sequenced, using an interview guide. The focus groups are used to increase the understanding of a certain issue. "What keeps them from doing it? What do they like or dislike about it? How do they feel about it? How do they think about it?" The method gave a wide variety of opinions as well as contact and presence with the snus-using adolescents to get more knowledge, but without reaching consensus.

Finally, yet another quantitative study was done with the focus on studying factors that may be associated with being tobacco-free. Instead of looking for risk factors, this study contributed a new, salutogenic perspective and discussed factors that influenced adolescents to remain tobacco-free.

Setting

All the studies were performed among students in the Kronoberg County in southern Sweden. In 2010, the county had about 184 000 inhabitants divided into eight municipalities, and the largest had 83 000 inhabitants. The county had 91 primary and secondary schools (for pupils aged 12–15) and 19 upper secondary schools (for pupils aged 16-19), mainly municipal but a smaller number of private schools. The majority of the pupils in upper secondary school (66 percent) went to schools in the largest municipality.

Design and study population

In total, four studies were conducted, and each study has been reported in a separate paper. Study I is therefore paper I, etc.

Study I and II followed the same grade students with repeated questionnaires. Study I from grade 6 (primary school, aged 12) to grade 8 and Study II continued up to grade 12 (upper secondary school, aged 18) conducted between 1994 and 2000. The response rates varied between 75.6 and 93.0 percent (table 1). The number of respondents was between 1 585 and 2 099 pupils in the different years.

The implementation of the survey was similar at all occasions in study I and II. At the start of the autumn term, an information letter on the survey was sent to the principal and the school nurse at the schools involved. The distribution of questionnaires was done by the school nurses to the class teachers who conducted the survey in the classroom. The questionnaires were completed anonymously in the classroom during school hours. The questionnaires from each class were put into an envelope, which was sealed and sent to the study leader via the school nurse.

Table 1. Study population and response rates for different years from 1994 to 2000, for studies I and II

Year (grade)	No. of pupils	No. of respondents	Response rate (%)
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 (grade 10)	2592	2099	80.9
1999 (grade 11)	2191	1854	84.6
2000 (grade 12)	2094	1585	75.6

Study I

Study I was based on questionnaires conducted in the same classes on three occasions in grades 6, 7 and 8. The effect of an intervention to school children in grade 6 (aged 12) with a questionnaire survey was studied. The intervention performed in grade 6 consisted of a visit from an inspirer, aged around 20, from the NSG organisation. He/she visited the classes twice, 80 minutes each time, with 2-3 week intervals. The class visit used a concept with discussions about norms, self-confidence and courage. But also to implement an evaluation practice and role-play about group pressure and the influence of advertising.

All schools with pupils in grade 6 were offered a visit from NSG, and 59 schools, 80 classes in total, accepted and constituted the intervention group. There were 21 schools, in total 22 classes, which declined the offer and constituted the comparison group.

Before the inspirer visited the classes, a baseline measurement was made using a questionnaire about tobacco habits to all the pupils in the county at grade 6 in all the 80 schools.

The questionnaire was repeated, one and two years later, to the pupils in same classes as the first opportunity (figure 2). The pupils attended 20 different schools in grade 7 of secondary schools, spread over 87 classes.

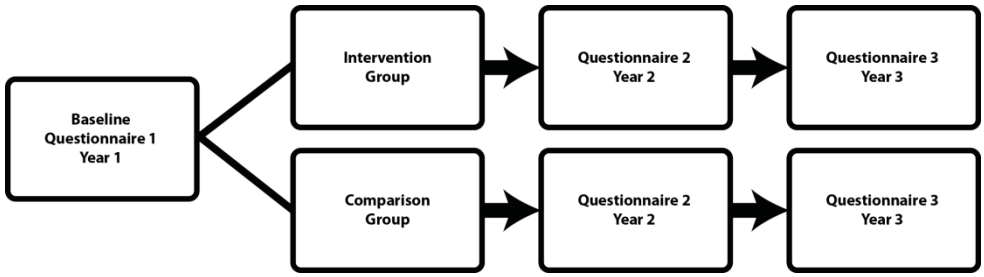

Figure 2. The process of study I

Study II

Adolescents' tobacco habits were followed prospectively over a seven-year period. The previous material extended from Study I and all pupils in the current class were invited to participate in the survey once a year from age 12 to 18. Since this was a repeated cross-sectional survey, pupils were able to move into and out of the group without possibility to follow them on an individual level.

Study III

This study was performed as focus group interviews, with pupils from different grades in upper secondary school (17-19 years). Focus group interview was the selected method as the aim was to study the opinions, thoughts and attitudes to being snus users among adolescents. Focus group interviews also give insight to the use of ideas and concepts in a social context. They bring you closer to people's attitudes than what the answers to individual interviews would. The relative anonymity (being one of many who are interviewed) makes it easier for the group participants to relax and voice their opinions freely (100).

The selection of schools was made on the basis of the survey conducted in 2009 (Study IV) at upper secondary schools on health and life habits. The selected schools were the ones with most pupils who were only snus users. The criteria for participation in the interview study were that the adolescents only used snus and did not smoke. The principals involved received information in writing on the study and gave permission in writing

for the interviews at the school. The school nurses received information both orally and in writing on the aim and the recruiting of pupils for the study. The school nurses at the selected schools recruited pupils to the interviews and all the pupils attended the vocational upper secondary program leading to professional training, such as construction workers, electricians, farmers, car mechanics, and animal keepers. A few of the selected schools also had academic upper secondary classes but these programs had very few pupils using only snus. None of them was interested in participating in the study. Adolescents participating in the interviews had received information from the school nurse at the schools involved on the aim and the procedure, and that all the material would be confidential. The interviews were held at the participants' schools, three in total.

Of the 27 pupils interviewed, four were girls. Boys and girls were interviewed separately in order to try to bring out the differences between boys and girls. There were 5-6 participants in each group, five focus groups in total. It is the ideal group size to give all participants an opportunities to share their experiences (101).

One of the researchers (IE) was the moderator in all the groups. Interviews were recorded on tape, and field notes were taken by one of the co-researchers. The length of time for the focus group interviews varied between 40 and 60 minutes. All interviews started with an introductory presentation with names, ages and which program they attended. Then, the conversation moved to the key questions, starting with "How come you began using snus?" The interview continued with semi-structured questions on different themes. If the questions were not sufficiently responded to spontaneously, some follow-up questions could be asked to get a better understanding and deepening of the theme.

Study IV

This study was a cross-sectional study conducted in the autumn of 2009 with all the pupils in upper secondary school, grade 2. A questionnaire was distributed to 2 666 pupils, and the response rate was 83.9 percent (n=2238). At the time of the study, most of them were around 17 years of

age. Most of them, 93 percent, were born in Sweden. It was more common that girls attended the academic program, 58 percent vs. 42 percent for boys. The survey included questions on health and life habits.

The survey was supported through letters to and information meetings with the school leadership and principals at the schools involved. Information on the study approach and how it would be conducted was given at a meeting with the school nurses. Later, information in writing was sent to them and to the class teachers involved. Well before the study, an information folder was distributed to the pupils through class teachers/mentors.

Distribution of the questionnaires was done through the school nurse to the teachers involved, who then conducted the survey during class. At the time when the questionnaire was completed, the pupils received more information, orally and in writing, on the survey. Completing the questionnaire was totally anonymous, and nothing was entered to reveal the pupil's identity. After the pupil had handed in the questionnaire in a sealed envelope, the class teacher gathered the questionnaires and the school nurse sent them to the R&D unit at Kronoberg County Council. The questionnaires were scanned for data computation and were then analysed in the SPSS statistical software.

Definitions

The questions on tobacco habits were unchanged for all survey occasions in Studies I and II. From grade 7, questions were added to the questionnaire about whether the pupils had been visited by NSG in grade 6 and what school they attended at that time. Questions were also added on whether they thought they would be smoking at age 20, whether anybody in the family was smoking and whether the parents allowed the adolescents to smoke. However, the definitions of smoking habits were different in the studies.

The following definitions were set from the responses. The question "Do you smoke?" had four response alternatives: Yes; No, I have quit; No, but I have tried; and No, I have never smoked. Those who responded Yes to this

question had follow-up questions on how often and how much they smoked. In Study I, the "current smoker" group was defined as all who responded Yes to the question of whether they smoked, regardless of how often or how much they smoked.

In Study II, two questions were used for grouping smoking habits. Like in Study I, The question "Do you smoke?" had been used, with response alternatives that they had never smoked, had quit or had tried. And the question "How often do you smoke?" with five response alternatives: Every day, Nearly every day, Only at weekends, Only when I am at a party/disco, Hardly ever. "Daily smokers" were defined as those who responded that they smoked every day or nearly every day. "Occasional smokers" were defined as those who responded that they smoked at weekends, at parties or hardly ever.

The question "Do you use snus?" had six response alternatives. No, never; No, but I have tried; No, I have quit; Yes, less than one box a week; Yes, 1 box a week; or Yes, 2 or more boxes a week. In Study II, snus users were defined as those who responded Yes, regardless of quantity.

In Study IV, the questions on tobacco habits were the same as those in Studies I and II. Smokers were defined as those who responded Yes to the question "Do you smoke?", regardless of how often, and those who responded that they had quit. A corresponding division was done regarding snus habits. Snus users were thus defined as those who responded that they were using snus or had quit. Those who responded that they had never smoked or used snus, respectively, were placed in the smoke-free or snus-free groups, respectively. Therefore, snus-users are included in the group smokers and smokers are included in the group snus-free.

Validity and reliability

In Studies I and II, we used the same survey questions on tobacco habits as those used at that time in the CAN surveys (102). These questions had been used for similar target groups and were deemed very reliable, and the results had proven to be stable over time. CAN has not reported any

validation of the questions but had a low internal dropout. This has led to the assessment that the questions had functioned well (personal communication, CAN 14.02.2012)

In Study IV, a far more comprehensive questionnaire with more than 90 questions was distributed. Most of the questions concerning health and life habits were taken from the Swedish version of the HBSC study from WHO. These questions have been validated, which has been described in the international report (103, 104).

Study III was a qualitative study, where the concept of credibility was used for reliability. All the focus groups in the study were led by the same moderator, which increases reliability (101). As two of the researchers came up with the same results when analysing the material, independently of each other, the validity and credibility of the results are strengthened (105). To further increase the credibility and get more ideas on different interpretation possibilities, the preliminary results were discussed at research seminars with other researchers and people who work with adolescents. This increased the reliability of the results.

It can be deemed valuable for the assessment of validity that two of the researchers had good knowledge on the subject when making the analysis, as this would facilitate reasonable designations and interpretations. To illustrate the results on the basis of different experiences by the participants, the variations in the results supported by quotes have been described (105).

As there were limitations in the sampling for the interview study, it is up to the reader to decide the extent to which the results can be transferred to other groups or contexts (106). To enable an evaluation of the study context and an assessment of its transferability (105), the study has tried to give as accurate a description of the sample, participants, data collection and analysis as possible.

Analytical methods

Quantitative data

The questionnaires had data on a nominal or ordinal scale. The questionnaires for Studies I and II were computed in the Quest statistical program. Epi-info version 6 was used for calculating RR with a 95% CI.

Study I

The development of smoking was compared between the group that had an intervention from NSG, and a comparison group, two years after the intervention. RR was used to indicate whether there was a change in the risk of smoking in the intervention group compared to the comparison group. The comparison between intervention schools and comparison schools was made using the z-test.

Study II

The development of smoking habits was followed for girls and boys, respectively, divided into five different groups that described their smoking habits over all grades for seven years. The results were reported by percentages, and RR was calculated to demonstrate differences in smoking between the sexes and age groups.

Study IV

Traditional surveys report risk factors for starting to smoke. In paper IV, another approach was chosen, and factors analysed what could be important in order to stay tobacco-free. Because of the salutogenic approach in the study, the results of the logistic regression analyses were expressed as Positive Odds Ratio (POR) with a 95% CI. Here, a positive correlation with an influence is studied, instead of the risks, which can be seen as more suitable as it highlights the health promotion perspective.

The independent variables were dichotomized based on the median value, i.e. the division nearest at hand for splitting the material as close to the 50 percent median as possible. This was done in an attempt to get as neutral a division as possible.

Logistic regression analyses were made separately for girls and boys. The dependent variables were smoke-free and snus-free, respectively. Following the salutogenic approach in the study, factors associated with not smoking and not using snus were identified using the χ^2-test. Variables included in the model were those with a significant ($p<0.20$) bivariate relationship to the dependent variable and with low correlation ($rs^2<0.20$) to each other.

In the logistic regression model for snus use, 19 independent variables for girls and 22 variables for boys were included, and for smoking, 29 independent variables were included for girls and 28 for boys. For all analyses, the significance level was set at $p<0.05$. The analyses were performed using a backward procedure, with a step by step elimination of non-significant predictor variables, until all remaining variables were significant.

Data analyses were carried out using the Statistical Package for the Social Sciences (SPSS) version 17.0 for Windows.

Since the study was done anonymously, further analysis with regard to non-responses has not been performed.

Qualitative data

In Study III, the interviews were recorded on tape and transcribed verbatim. The researcher listened to the interviews immediately after the data collection. We listened to the tapes again, while reading through the transcribed interviews. Thereby, we could check that the transcripts were correct, while making ourselves familiar with the material. Content text analysis inspired by Graneheim and Lundman was used for analysing the material (105). The material was analysed with both latent and manifest content analysis with an inductive approach (105), where the aim was both to acquire knowledge and to understand the phenomenon studied. The adolescents' reports of thoughts, feelings and actions related to their experiences of being snus users were identified and coded, i.e. labelled due to contents. The codes were developed as the data material was analysed. When the different interviews were compared to each other, a code could be interpreted and made more specific, and another code could be

reformulated to cover several responses with a similar content. Codes with similar meanings were grouped into categories. During the analysis process, the author repeatedly returned to the tape recordings and transcripts. The interpretation of the responses that were identified as relevant to the aim could thus be made on the basis of how the response appeared in its context. The manifested content of the data material was structured into categories, which were illustrated with selected quotes. Three common themes that represented the latent content of the text were identified. The method was suitable as this analysis method is used for identifying variations regarding differences and similarities in the text. An unbiased analysis was made based on the adolescents' narrations about their experience of using snus. The meaningful units were identified from all interviews and were then condensed and coded and eventually brought together into various categories (table 2). To illustrate the results, three themes were then extracted on the basis of the eight categories found.

Table 2. Example of the analysis process in qualitative content analysis

Meaningful unit	Condensation	Code	Category
It started tasting nice after a while, after trying a few times, and then I just continued and became an addiction.	It started tasting nice after trying for a while, and then it became an addiction.	It tasted nice, and one became addicted.	Caught in an addiction.

Ethical considerations

The principle of informed consent is a basic ethical principle in research involving people. It means that the person who has been asked to participate in a study should have been given such information on the aim and design of the study that he/she can decide whether to participate or not (107). In all the part studies, informed consent was obtained from the respondents. The adolescents received oral information on the possibility to decline participation. In Studies III and IV, information was also given in writing.

Participation in research should be voluntary (107). This principle is particularly important and requires special considerations when the research involves children and adolescents. When the questionnaires for Studies I, II and IV were completed, this was done anonymously. Before the focus group interviews, the adolescents were informed that they could abandon the interview at any time if they liked.

Another basic ethical principle is to protect the integrity of the participants (107). This includes adhering to the Personal Data Act (PDA), that research data is kept in a safe place and that published results are totally unidentifiable and cannot be derived for specific individuals. All the questionnaires used in the part studies were completed anonymously and all the tapes with recorded interviews are only numbered, not labelled with names. No data material can thus be linked to specific individuals. All the data material is kept locked up.

Completing questionnaires and participating in interviews could result in the arousal of thoughts and worrying reflections afterwards. In Studies III and IV, the participants received information both orally and in writing by the school nurse, with the invitation to get in touch if they have any questions. This gave the participants the possibility to take up issues both before the studies were conducted and afterwards. Furthermore, teachers

and school nurses were informed about the studies so they would be prepared for any possible questions related to the studies.

All the studies included in this thesis adhere to the Declaration of Helsinki and its Ethical Principles for Medical Research and have been approved by the County Council's local ethics committee, Regional Ethics Committee at Linköping University (Reg. No. 175-09) or the Research Ethics Advisory Committee at Kronoberg County Council (6/2009).

Results and comments

Paper I

Development of school children´s smoking habits. Questionnaire studies in intervention and control groups

At the baseline in grade six, there was no significant difference between intervention and comparison groups regarding smoking, RR = 1.35 (95% CI 0.47 – 3.84). Two years after the intervention, in grade 8, the proportion of current smokers in the intervention group (8.4 percent) was approximately two thirds of that of the comparison group (12.7 percent). This gives the intervention group an RR = 5.37 (95% CI 3.55 – 8.13) versus the comparison group RR = 11.03 (95% CI 4.01 – 30.33) for smoking. The analysis was based on individual responses on whether the school children reported that they had been visited by NSG or not, and the difference between these groups was statistically significant.

This analysis was based on the group level, and the difference between the two groups was statistically significant.

Another analysis was achieved when the schools were used as the unit, between intervention schools (59 schools) and comparison schools (21 schools). The analysis was made on the basis of the pupils' reports on what school they attended in grade 6 (when the visit from NSG took place). In a comparison between these two groups of schools, no differences in smoking habits were found (p= 0.24; z =1.18).

The results showed that in grade six fewer girls than boys were smokers. However, in grade eight there were more smokers among girls. Snus use was more common among boys in grade eight.

Comments

Carrying out a result evaluation of tobacco-preventing interventions is a great challenge, and also something that is lacking in Sweden. A method with contract signing between a pupil and an adult, and where the surrounding people were also influenced to result in a supportive environment, has shown positive results (108). Study I showed that adolescents who had class visits from NSG smoked less to a statistically significant degree than those who had no such intervention. There are, however, certain reservations to this conclusion. In the questionnaire in grade 8, the pupils were asked whether they had a visit from NSG or not in grade 6. It is possible that pupils who did not smoke remembered the class visit and may have been influenced by the message to a greater extent than those who two years later reported in grade 8 that they were smoking. It would, of course, have been more valuable, and would have yielded a more reliable result, if it had been possible to conduct the study at an individual level, and then a long-term follow-up would also have been possible.

In this study, we did not know if the intervention schools had been interested in tobacco prevention even earlier, or if they considered it beneficial to have someone from outside the school take on that task. When the pupils reported what school they attended in grade 6, the response analysis compared the group from schools that had been visited with the group from schools that were not visited. Then, the results showed no statistically significant difference between these groups.

When we used aggregate data, it means that this study was a so-called ecological study and it was not possible to do the analysis at an individual level. It is difficult to separate the effect of the intervention from the effects of other surrounding factors. Thus, the interpretation of the results was done with caution, as the knowledge of systematic factors may have influenced the result differences and we may not be able to conclude that NSG caused differences in smoking habits. It may still be justified to make a positive interpretation of the results as they did show a difference between the groups when the analysis was done on data based on the individual responses.

Paper II

When do adolescents become smokers? Annual seven-years population-based follow-up of tobacco habits among 2000 Swedish pupils – an open cohort study

In grade 6, 2.0 percent of the boys and 0.9 percent of the girls stated that they were currently smokers (p=>0,05). Seven years later, in grade 12, there were significantly more female than male smokers, 33.1 vs 24.6 percent (p=0,01). Among both sexes, the increase of daily smoking occurred mainly between grades 7 and 10 (figure 3).

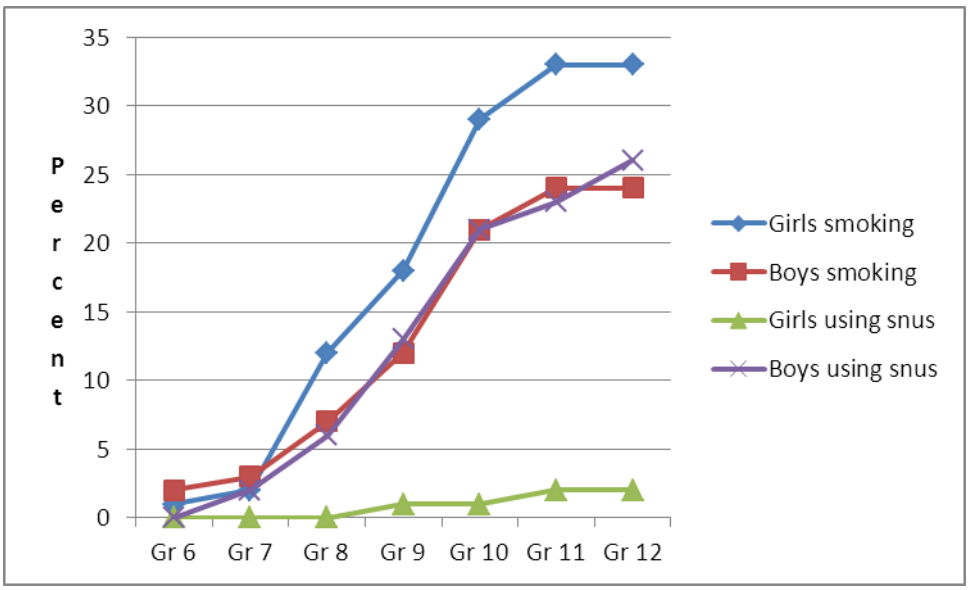

Figure 3. Current smokers and snus users from grade 6 (aged 12) to grade 12 (aged 18), boys and girls, respectively

Snus use was introduced later in the teenagers' life than smoking, and it was more common among boys. In grade 9, one percent of the girls and 13 percent of the boys used snus (p=0,01). Three years later, in grade 12, two percent of the girls, and 26 percent of the boys (p=0,01), reported that they used snus, regardless of how frequent (figure 3).

From grade 9, boys had a higher total tobacco consumption than girls, basically dependent on differences in snus use. The last year of the study,

39 percent of the boys and 34 percent (p=0,05) of the girls used some form of tobacco.

The results also showed that adolescents who smoked more often had some family member who smoked compared to adolescents who did not smoke. The pupils in grade 12 were asked about the reason for not starting to smoke or giving up smoking, respectively, and health reasons were the main explanation for both smokers and non-smokers (30 and 35 percent, respectively). The second reason was a financial motivation (17 and 14 percent, respectively).

Comments

The tobacco debut was different between the sexes. A slightly larger number of boys than girls started smoking in grade 6, but the girls accelerated faster to becoming regular smokers. At this point, the study showed that boys were responsible for a larger tobacco consumption, but a change has occurred today and national studies show that girls have a somewhat larger total tobacco consumption than boys in grade 9 (28). In grade 11, however, this has become levelled and the difference between the sexes is insignificant. The situation that girls smoke more than boys do, and that boys use snus more than girls do, has remained throughout the years.

The results are not based on individual data, and therefore the assessment of changes in tobacco habits has been done at group level. The study was performed in the south of Sweden, with no large cities. However, the results may be generalized to adolescents in similar settings. Both Swedish and international studies indicate a similar pattern, where the tobacco debut among a majority of smokers takes place before the age of 18 (9, 109).

The study, like a number of other studies, showed a correlation between the adolescents' smoking habits and the smoking habits in their families (45-49). It is important to consider these aspects when planning tobacco prevention, and the entire family should be involved.

Paper III

Snus user identity and addiction. A Swedish focus group study on adolescents

The analysis of this qualitative study includes three themes developed from eight categories (table 3). These themes took up areas regarding the circumstances influencing the adolescents when they started using snus and upholding the habit, factors making them continue to use snus, and what the snus meant to them, and finally their approach to their roles as snus users in relationship to others and how they saw themselves in the future. The first theme was *Circumstances pertaining to snus debut*, and most important was significant others. All the participants had been influenced to start using snus by friends who offered snus. Even though there is an 18-year limit for buying tobacco products in Sweden, it was usually easy to get snus. The pupils bought it themselves or got it from friends. The second theme, *Upholding*, described the reasons making them continue to use snus, and what the snus meant to them. They experienced that they became addicted, both physically and socially, but they discovered this too late when it was difficult to quit. They also wanted to become part of a group that gave them an important identity. The adolescents perceived more benefits to using snus compared to smoking. Smoking was seen as more dangerous for the health and there were more restrictions about where they could smoke or not.

The third theme, *Approach*, was about the attitudes to their role as snus users in relationship to others and how they saw themselves in the future. Even though the adolescents themselves had been influenced by others to start using snus, they did not feel that they influenced younger people to start. The views of the adolescents were ambivalent about whether they should continue with snus in the future or not.

Table 3. The eight categories and three themes in the analysis

Categories	Themes
Influenced by significant others	Circumstances
Availability	pertaining to
Parent reactions	snus debut
Caught in addiction	Upholding
Identity	
Perceived advantages	
Influence others	Approach
Ambivalence	

The process of becoming a snus user can be described in different steps (figure 4). The feeling of being cool and a desire to impress others were strong in the beginning after the tobacco debut. It takes some external circumstances to become a snus user – friends who offered snus, and later they bought it themselves. It was an unpleasant experience in the beginning but they practiced and learned. The feeling of belonging to a group that use snus gives fellowship and an important identity. It was mainly the boys who reported that they felt manly when they used snus and that it belonged to their future professional identity. The girls wanted to stand out from the masses and saw themselves as tomboys. Furthermore, the picture became complicated due to a rapidly developed addiction, without the adolescents being aware of the symptoms of this. At this time, they also found it difficult to quit. When they felt addicted, the feeling of being cool had declined and some even admitted that they regretted that they started using snus.

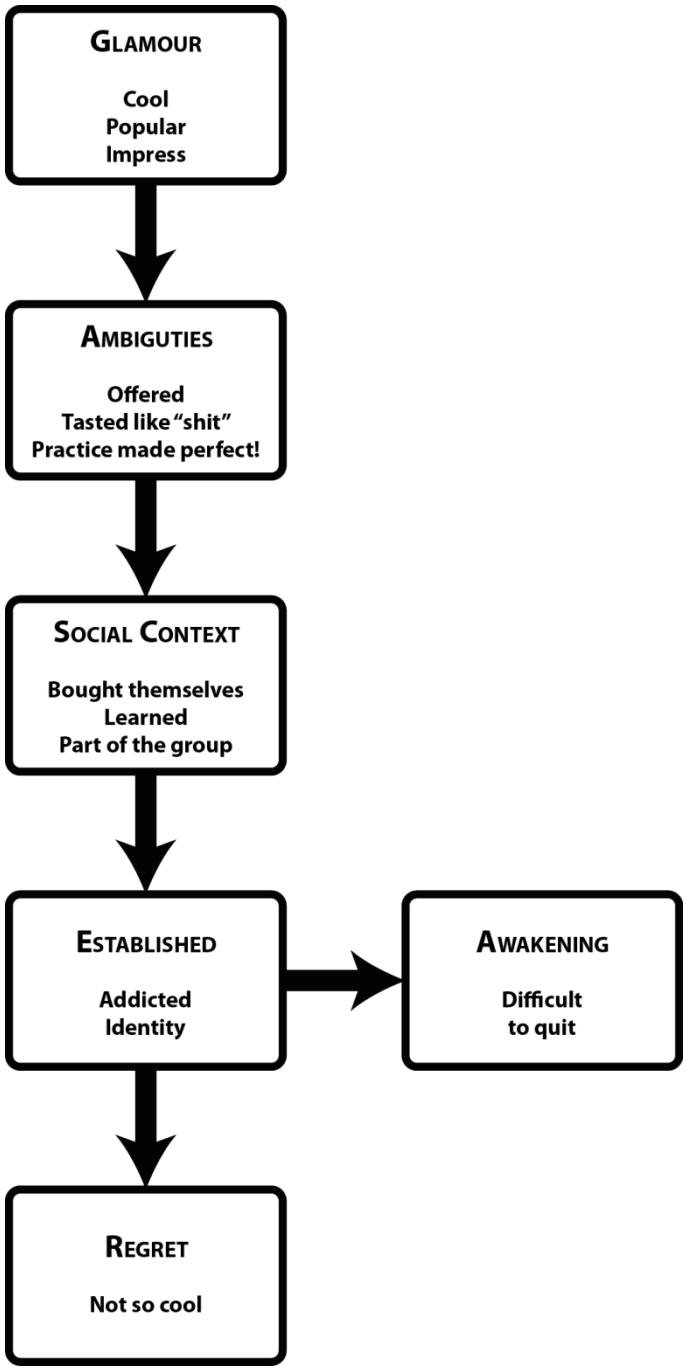

Figure 4. Development to being a snus user according to the study about adolescent snus user identity and addiction

Comments

This study has given adolescents a possibility to share their own thoughts, experiences and attitudes concerning their own use of snus, as well as on snus in general. The findings give an idea of how snus-free adolescents become snus users and the underlying factors for this, and the results can contribute to an understanding of how this process develops and the underlying influences.

The most prominent aspect of the results was the experience of identity as a snus user. The boys in the study felt it was manly to use snus, but using snus was also linked to their future professional identity. The girls even admitted that using snus was not for feminine girls but something that tomboys did. It is important to consider the social context pertaining to the reason for starting to use tobacco. According to Tajfel's theory on social identity, people identify with those they feel are most like themselves, and they join the group that positively affects their social identity (66).

The results included the fact that adolescents experienced an early addiction to nicotine. It has, of course, been described earlier in the literature that addiction comes faster and unexpectedly, but that information comes from completely different types of studies than letting the adolescents report this themselves (38, 110). This study also revealed that they experienced abstinence symptoms long before they understood themselves that their symptoms were just that. The younger they are when they start using tobacco, the more likely they are to become addicted to nicotine, and the more heavily addicted they will become (9). One study has shown that adolescents find it difficult to understand what abstinence symptoms really are, and what they mean (41). Once they were stuck with both a physical addiction and had created an image and an identity, it was hard to quit using snus. The important thing is that the adolescents gained this insight by themselves. To prevent an undesired addiction from developing, it is important to give information and spread knowledge on the addiction issue to both adolescents and their parents. This task should be part of the tobacco-preventive work, for example by the school health service. Developed, successful methods for tobacco cessation adapted to adolescents are lacking (92). Tobacco cessation methods for adolescents have been less

effective than those for adults, but experiences of trying to quit may contribute to the possibility of becoming tobacco-free in the future. A number of attempts are often needed before they manage to quit, and this is true for adolescents as well (38).

Paper IV

The social environment is most important for not using snus or smoking among adolesents

The results showed that in grade 11 in upper secondary school, 74.3 percent of the girls and 61.5 percent of the boys were tobacco-free, i.e. did not smoke or use snus. To be smoke-free was more common among boys than girls, 91.4 percent vs 79.2 percent. The corresponding proportions for snus-free were for girls 98.9 percent and 84.7 percent for boys.

The logistic regression analysis indicated variables that were related to being smoke- or snus-free, respectively, for the adolescents. A tobacco-free environment had a major influence on whether or not adolescents stayed tobacco-free. To have a snus-free best friend had the highest correlation to being snus-free for both girls (POR 10.10) and boys (POR 7.32). Being snus-free was related to a snus-free mother (POR 3.15) and sister (POR 4.87) among girls, while being snus-free was influenced by a father (POR 1.6) and brother (POR 3.32) among snus-free boys. To drink less alcohol was also associated with being snus-free, for both girls and boys (POR 6.19 and 5.28, respectively).

There were many identically related variables for being smoke-free for the two sexes. To have a smoke-free best friend was the variable with the highest POR (7.03 for girls and 9.03 for boys). A larger number of tobacco-free family members were positively correlated to adolescents being tobacco-free, and this correlation was stronger for girls than for boys.

Comments

This study bears a sign of a salutogenic approach, where the analysis is based on a health promotion perspective. According to Antonovsky´s theory about salutogenesis, the focus is on resources that cause and preserve health (97). Thus, this study has focused on factors that show a covariance with being tobacco-free, with the intention that the results may eventually lead to the development of strategies for strengthening these factors and resources.

The closest friend being tobacco-free was the factor with the strongest covariance for both sexes to being smoke- or snus-free, respectively. Boys who were snus-free seem to be more influenced by manly role models, i.e. if fathers and brothers were snus-free. Girls were more influenced to be snus-free by snus-free mothers and sisters. This result also supports the findings of Study III, which showed that using snus was something that the adolescents associated with being manly or a tomboy. The study showed that the influence of friends was stronger than that of parents with regard to being tobacco-free during adolescence. But tobacco use in the family may also make adolescents who start smoking smoke even more, and they are more likely to develop into daily smokers than those whose parents do not smoke (45). Study IV also showed that the more family members were smoke-free, the greater the possibility that the children remain tobacco-free. A corresponding pattern was seen in a study where a larger number of smoking family members increased the risk of smoking among the children (111). It is not only the tobacco habits of the surrounding that influences the adolescents, but also the norms and attitudes among both friends and parents. Therefore, it is important to strengthen the norms of being tobacco-free in the adolescents' environments.

Individual determination factors such as drinking less alcohol was a factor which correlated with being smoke- and/or snus-free for both sexes. In 2011, an increasing number of adolescents report that they never smoked or used snus, compared to the end of 1990s in Sweden (28). A similar trend is seen among adolescents who report that they had never tasted alcohol. The result indicates that tobacco-free adolescents in general have a more healthy

lifestyle. This is not surprising, as adolescents tend to socialize with those who share their own norms and attitudes.

Public health efforts are increasingly striving towards the development of supportive environments in various arenas. Therefore, it feels right to turn the perspective from risk factors to resources, from tobacco use to tobacco-free, in this study. The health promoting interventions must focus on how to decrease the total burden of risk factors and increase the access to protective factors. The individual is affected by determinants in the environment, such as social and cultural context, school conditions, economic equality, etc. As the environment has a large impact, the school has a great challenge to work not only with the school environment and policies but also with family responsibilities, norms and attitudes to tobacco. A health-promoting school can be characterized by being a school that is constantly strengthening its position as a healthy setting for learning and working to give strength to and support healthy choices.

General discussion

The most important task of public health research is to identify, support and safeguard salutogenic factors that further health (112). Traditionally, the focus is usually on prevention and the study of risk factors, which can explain, for example, a single individual's tobacco use with the aim of developing tobacco prevention. The salutogenic perspective attempts to explain factors that contribute to creating and maintaining health, and this approach focuses on wellness factors and the resources that are close at hand. Study IV had a salutogenic perspective and showed factors that related to being snus- or smoke-free, instead of risk factors for smoking or snus use. It is a challenge to focus on resources instead of risks. Health promotion work targets investments in the population in general, while preventive action is primarily aimed at risk groups. Today's public health work needs both the preventive and promotional perspective (96).

To start smoking/using snus is a complex phenomenon with socio-demographic factors, personal qualities and environmental factors influencing the adolescents. It is important to focus on interventions aiming at both smoking and non-smoking adolescents since both influence their friends (113). Studies III and IV reflect on how important it is for adolescents to identify with their friends, even tobacco-free friends. Therefore, interventions such as the class visits from NSG should be aimed at adolescents in general. During the class visits, attitudes and norms towards tobacco use are discussed, and the visits also aim to strengthen their self-efficacy, the ability to turn down an offer of tobacco. During class visits, the so-called majority misunderstanding was revealed, and it is essential to highlight the misunderstanding that many adolescents believe that adolescents older than themselves, approve of smoking (65). There are also studies indicating that it is more effective if the teaching is led by adolescents somewhat older than themselves, as their norms are influential (114). The result of the

evaluation of the NSG activities was not unambiguous, but when the analysis was done at group level, their effect on the smoking habits of individuals cannot be ignored. Interventions of this kind should still be a natural part of the many activities that make up the tobacco-preventive work. This work is the most effective when different efforts are combined (9, 73).

Earlier research has shown that effective programs must contain strategies that both attempt to reduce the desire to smoke as an experiment and influence the effects of group pressure (110). Some other ways to work successfully with tobacco-prevention in school is a combination of individual health interview by the school nurses, a common policy and approach in school and leisure-time activities, a health-promoting school environment and methods such as contract-signing between a pupil and an adult (108).

Study IV showed that adolescents' tobacco habits were influence by tobacco-free role models. Attitudes and tobacco habits of adults in general, and parents in particular, have an important role, and more attention to and co-operation with them seem to be successful (108). Furthermore, adolescents are positive to parent intervention to persuade their children not to smoke and not allow them to smoke at home (78).

Study II concluded, like earlier research, that most adolescents were introduced to tobacco in their early teens, smoking appearing somewhat earlier than using snus. Studies investigating both tobacco debut and tobacco development should be able to give valuable information to decision-makers and other researchers about trends and patterns of tobacco use. Prevalence studies are of great importance for deciding when preventive intervention should be made. Most of the adolescents in Study II started smoking/using snus in their early teens. Thus, the time period soon before should be suitable for the introduction of tobacco intervention in order to"vaccinate" the hopefully still tobacco-free adolescents. As adolescents are at different stages of development, preventive efforts must be repeated continuously.

Study IV showed that the most important factor that related to smoke- as well as snus-free adolescents was to have tobacco-free friends. The results

also showed that a tobacco-free environment had a great influence on whether adolescents use tobacco or not. The results from Studies III and IV strengthen the impression that the norms in society should be influenced in favour of a tobacco-free society that also has tobacco-free environments. This supports the adolescents to remain tobacco-free and supports those who wish to quit using tobacco (9). The school has a very important role in the health promotion work with children and adolescents, as they spend so much time in school, and in principle, everybody can be reached there regardless of social background. The efforts made in school can thereby have a levelling effect on social differences regarding health. According to the Swedish School Act, the school health service should work with both preventive and health promotion activities. The development of a health-promoting school enables further development of healthy behaviour and the strengthening of the individual's resources needed to meet the strains of everyday life. It is also important to identify the cultural and social situation for the adolescents and the social and psychological processes involved in their use of tobacco. Since its introduction in the early 1990s, the work on a health-promoting school has developed towards a more salutogenic and evidence-based approach, which is the one that is the most recommended (115).

The opinion that the tobacco issue is a health issue and not an order issue should be characteristic of the common school approach. This of course requires that the school leaders, the school health service and the staff cooperate and see their role as one that creates health and not only conveys knowledge. The most important deciding factors for being tobacco-free that can be influenced by the school are self-confidence, skills to resist group pressure, the ability to solve and handle problems, as well as social competence. Furthermore, the school should convey knowledge on the harmful effects of tobacco. The teaching should take up problems and discuss tobacco with the pupils from a relevant perspective, such as the environment, child labour and the marketing methods of the tobacco industry.

According to the Swedish Tobacco Act, it is illegal to smoke on the school premises, but by reinforcing the message of freedom from tobacco the schools can choose to have tobacco-free school hours. This can be

compared to the introduction of smoke-free working hours for employees at their workplace. It is also vital to consider snus use as an important health issue. The effects of snus should be compared to not using any form of tobacco, not only seen as an unhealthy alternative to smoking. A tobacco-free school hour means that nobody uses tobacco during school time. The implication is that the adults show that freedom from tobacco is the norm. Such an approach must be firmly established step by step. It is important that the school expresses what it expects from its pupils. There are, for example, clear goals that the pupils get a pass grade in the basic subjects, but there is no clear goal about not using tobacco during school hours.

The qualitative study in this thesis, Study III, showed that the adolescents were well aware of the fact that they had become stuck with an addiction faster than expected, and that they had been unable to interpret early symptoms of abstinence problems. Once they were stuck with both a physical addiction and had created an image and an identity, it was hard to quit using snus. It is important to note that the adolescents themselves do not understand, and cannot interpret, their abstinence symptoms. The reason why many adolescents experience nicotine addiction already after using tobacco for a short period of time may be that their brains are still developing (9). Therefore, both the pupil health section, parents and adolescents should be informed that addiction symptoms may appear long before the adolescents are daily tobacco users.

When the adolescents feel a craving, the risk and probability for developing a daily use and an addiction increases. Then, it is important to support and encourage those who try to quit using tobacco (37). The school health service should be able to offer the pupils tobacco cessation programs. Presently, there is a shortage in developed methods to make adolescents stop using tobacco, and more research is needed on successful ways to help these adolescents.

Study III showed that the individual acquires a personal identity, which is shaped by the groups with which he/she tries to identify. The study showed that the individual identity and the influence by norms are closely linked to the social context in which we live. When the role model was to use snus, this did not need to be discussed or questioned by the group. For the group

to feel togetherness and develop a sense of belonging, opposites to what the group does not want to be are required. It was obvious that the snus users interviewed felt they were better and smarter than the smoker group. This strengthened the "we" group identity and confidence and their belief in themselves in relationship to the "they" group, the smokers. Manliness and future professional role were examples of important circumstances for starting to use snus. Through continuous snus use, the group identity was made clear, and the feeling of belonging and togetherness increased.

The focus is often on the individual's freedom, and the right to make your own decision is emphasized. However, this strategy has been criticized as an individual's behaviour and basis for decisions is to a great extent influenced by his/her social context (63). Reducing the total use of tobacco contributes to increased health equality, as the use of tobacco is more common in socio-economically vulnerable groups. In an international comparison, Sweden has low prevalence rates for smoking. The success in Sweden is largely due to that fact that several bodies at different levels have shown commitment and cooperated towards common goals and strategies. It is also possible that the low number of smokers is due to the fact that we live in a relatively equal country, which is an important factor for health and well-being (62). A socially unequal society makes it more difficult for the individual citizens to control their own lives and develop a social affinity. Interventions should include strategies for changing more general factors affecting people's health and life situation.

There are no simple miracle methods to solve the tobacco problem. The achievement of a tobacco-free generation cannot be done through legislation alone. A large number of activities are needed, and they are more effective if they are combined. Therefore, effective health promotion work is needed in order to create more supporting tobacco-free environments, influence norms and attitudes to make tobacco an exception and not the norm. Besides health promotion work, there is a need for preventive efforts with a combination of different activities such as information, opinion formation, education, tobacco cessation programs adjusted to specific target groups, legislation and an active price policy. The responsibility for this

work should be both at national, regional and local levels and be based on the tobacco convention (25).

There is a need for further salutogenic research to study factors, which influence the potential of keeping, improving and promoting health, but also to explore why some adolescents remain tobacco-free and to develop new strategies with a health promotion approach. The more factors working in a health promotion direction, the greater the chance of a tobacco-free adolescence.

We know a lot about why adolescents start using tobacco, but a lot still remains to be explored, including how we can further continued freedom of tobacco and how to prevent the use of tobacco among adolescents. We hope that the studies in this thesis can be the basis for development of continued research and methods for pragmatic work to further a tobacco-free environment and adolescence.

Methodological considerations

To get as multi-faceted a picture as possible of the complex relationships between tobacco use and adolescents, we used both a quantitative and a qualitative approach. Quantitative methods are historically based on traditions in natural science and positivism, while qualitative methods are based on a humanistic, hermeneutic tradition (116).

In public health science, the quantitative approach seeks answers to questions on causes, relationships and possibilities for making comparisons by obtaining figures on, for example tobacco habits, which can be computed statistically. The qualitative approach makes it possible to get closer to the meaning behind the figures and is important for an increased understanding of the adolescents' experiences. This increases the possibility to get access to thoughts and opinions at a deeper level.

Cross-sectional studies are commonly used when you want to explore people’s situations at a special time. Study I and II were conducted as repeated cross-sectional surveys, where pupils in the currently studied grade were invited and a comparison was made for these classes between

the years. The pupils participating in the studies were largely the same over the years, but there was no control of pupils moving within, nor into or out of, the county.

The schools were not randomized for the intervention in Study I, but decided themselves whether they wanted a visit from NSG or not. Schools selecting not to be visited should therefore be seen as comparison group, and not as control group in a traditional sense in an experimental study. At the baseline measurement of tobacco habits among the pupils, both groups were unexposed, which may have made an estimation of the relative risk using OR more relevant than using RR.

Conducting anonymous questionnaire studies have limitations. Data was handled using existing resources, and if the possibility and resources had been available, it would have been advantageous to follow data prospectively at an individual level, which would have provided more reliable results. Another limitation is that an analysis of dropouts cannot be done for anonymous questionnaires. An analysis of dropouts done by CAN showed that pupils who had been absent at the time of the study had a higher consumption of tobacco, alcohol and drugs than those who completed the questionnaire at the time of the ordinary data collection. However, the results were only affected by a few percent when later information on dropouts were considered (102).

One advantage in Studies I and II was the high response rate. It varied between the years in Study II, from 75.6 to 93.0 percent, where the younger pupils responded to a greater extent than the older ones. A possible cause of the variation in response frequencies is that pupils in upper secondary school to a greater extent than younger pupils decline to participate, and that the distribution of the questionnaires was more difficult at upper secondary schools where more teachers were involved. At the time when the questionnaires were completed, the teachers had no forms for entering reasons for pupil absence or non-participation. Conducting questionnaire studies during school hours means fewer dropouts compared to posted questionnaires.

For questionnaire studies, one may question whether the adolescents responded truthfully about their tobacco consumption or not. A Swedish

study showed that 15-year-old adolescents reported their true nicotine consumption to a great extent (98 percent) (117). This indicates that questionnaires form a good basis for following both the prevalence of tobacco habits among adolescents over time, as well as factors related to the use of tobacco. Thereby, they are considered a knowledge base for intervention efforts.

Studies I, II and IV analysed the pupils' smoking habits based on various definitions adjusted for their aim and evidence. In Study I, current smokers were defined as those who responded that they were smokers, regardless of how often they smoked. The pupils in this study were in their early teens, which is the time period when tobacco habits are formed but not yet established. It is therefore relevant not to differentiate between daily smoking and occasional smoking for these age groups. One reason for studying all those who responded that they smoked (regardless of how often) and not just look at daily smokers, is that those who smoke are most likely addicted. Even if the craving for cigarettes only comes once a month or once a week, it is an addiction symptom, and it is very likely that the time between the cravings for a cigarette diminishes successively, because the tolerance among these smokers increases. This means that they need more nicotine more often to get the same kick as before (41).

Study II differentiated between five responses alternatives regarding smoking habits to create a picture of how the different habits in the respective groups developed over the seven-year period. The smoker group was divided into daily smokers (daily or nearly daily) and occasional smokers.

On the basis of new knowledge and acquired empirical data, a new differentiation of the smoker group was made in Study IV. As adolescents who reported that they had quit smoking have a tendency to start smoking again, they were part of the smoker group (118). Hence, both smokers (regardless of how often) and those who responded that they had quit smoking were included in the smoker group. If snus-users had been excluded from the smoke-free group, the group had been tobacco-free, in Study IV. Since the aim was to study the factors related to being smoke-free and snus-free, respectively, in comparison to those who were smoking

or using snus, respectively, the smoke-free group may include snus-users, and the snus-free group may include smokers. One indication for this was that smoking was also a risk factor for starting to use snus, and vice-versa (119).

Focus group interview was selected as the method in Study III where the aim was to study the adolescents' opinions, thoughts and attitudes on their use of snus. Focus groups give insight to the use of ideas and concepts in a social context. Here, it was possible to come closer to the pupils' attitudes than through the responses from individual interviews. Sharing your opinion in a group may be more comfortable to the adolescents than having an individual interview, where you are more exposed and you may not have the courage to express your opinions. The relative anonymity (one of many who are interviewed), and when they felt safe and comfortable with others like themselves, (in this study, boys and girls were separated) there was a greater chance that the pupils relaxed and brought up their views (100). On the other hand, a group may curb deviating opinions, whether you know the other participants or not. Some knew each other in the groups, which may lead to a certain internal jargon and may have disturbed the discussion. However, the experience was that it made the members of the group feel more secure, and that it was easier to have the courage to say something.

Study III has its limitations, of course, since the recruiting was only made among pupils from vocational programs. This was due to the difficulty to find a large enough number of adolescents who were using snus without being smokers from the academic upper secondary program. As the results showed that using snus was strongly related to the pupils' future professional group, it would have been interesting to interview a group of adolescents from the academic program to see if there were any differences in their attitudes to and experiences of snus. However, this was not possible. At the same time, the pupils interviewed were possibly more representative of the group using snus, as a far larger part of the pupils using snus are attending the vocational programs than the academic ones (own unpublished data). We would also have liked to interview more groups with girls to be able to illustrate sex differences more clearly. In

general, very few girls in upper secondary school were only using snus. Thus, it was only possible to have one focus group with girls.

Study IV was a cross-sectional study aiming to find factors, which had a covariance with being snus-/ and smoke-free, respectively. Here, POR was used as an explained outcome variable, and the positive variable outcome, i.e. being snus-/ and smoke-free, respectively, is instead described for the negative outcome. The method with POR was first used and described in 2002 (120). This gives the study a salutogenic perspective, which gives an idea of how the health promotion work should be strengthened for freedom from tobacco, instead of for example only work with a preventive approach, such as tobacco cessation (96).

We would of course have liked the questionnaire study to have had a salutogenic perspective regarding the phrasing of the questions, instead of traditional phrasing. With a salutogenic approach to adolescents' living habits and health, it is a challenge to find measurement methods, which could focus on resources and positive factors and not only on risk factors.

Conclusion

During adolescence, health behaviour, which to a great extent remains throughout life, is formed. In these years, many limits are being tested, and among them a lot of adolescents try smoking or using snus, on one occasion or a number of times, which may eventually lead to the use of tobacco for many years. However, the rate of non-smokers and non-users of snus has increased over the last decade. It is during the early teens that the smoking debut takes place, while starting to use snus comes somewhat later. Smoking is more common among girls and using snus is mostly seen among boys.

The reasons why adolescents start using tobacco are many and complex. The use of tobacco is something which is part of seeking an identity, both as an individual and as part of a group. The development of addiction is a factor, which the adolescents underrate and think they can master. When they have used tobacco over a shorter or longer period of time, they realize that they are stuck in an addiction, and that quitting is associated with considerable difficulty. Snus-using boys also saw their use of snus as an important part of their identity – as a man or a future tradesman. The girls using snus felt that it was tomboys who used snus, and not girls they considered to be more feminine. To have smoke- and snus-free friends is what matters for adolescents to be smoke- and snus-free, respectively. Even tobacco-free parents have a strong influence on their children. Tobacco-free adolescents have more healthy habits as well, such as not drinking alcohol often or in large quantities.

Today's public health work needs to cover both preventive and health promotion efforts. Interventions at a local level, for example with NSG, are important at an individual level for choosing a tobacco-free life. The norms and attitudes in society influence our behaviour, and developing more tobacco-free environments is important for making more people remain or

become tobacco-free. Investments in developing health-promoting schools, an environment supportive of health, are a good investment for our adolescents. In the school environment, there are ample possibilities to further the development of healthy behaviour and good resources for meeting the strains of everyday life. The school environment has plenty of opportunities to convey tobacco-free norms and should offer a tobacco-free environment. It should be possible to achieve totally tobacco-free school hours for both pupils and staff. This means that nobody uses any form of tobacco during the school day. Adults must take their responsibility by showing that the norm is freedom from tobacco, at least in school.

Acknowledgement

Anders Håkansson – my main supervisor from 2005. Without his support, and commitment and trust for many years, I would never have had the idea to be a doctoral student at all. The emptiness after he died in the winter of 2010 is enormous.

Göran Ejlertsson – my main supervisor from March 2010. Your knowledge, accuracy and sharp eyes have been my security. Thanks for all your comments on my manuscripts! You also gave me a new way to walk with the salutogenic approach – and a lot more work!

Lena Lendahls – my co-supervisor, my "sister", and my travel partner. Thank you for all your advice, critical reading and meetings with lots of laughter.

Margareta Troein – my co-supervisor. Competent, enthusiastic and committed you came into the later part of my work and contributed valuable views and support.

Tobias Andersson – co-author of Paper IV and introduced me to the most important things in SPSS. Thanks for your good cooperation.

Per Nyberg – you taught me statistics patiently year after year, and apart from being very patient, you are always in a good mood.

Alf Öst – thanks for fast and professional help with the English language.

Eva Pettersson Lindberg – my boss. Thanks for listening, supporting and helping me make the work with the thesis easier for me in many different ways.

Dorthe Geisler – you wrote the transcripts verbatim and were fantastic to hear what the youth mumbled into the tape recorder. You also supported me with PDF, figures and tables in this thesis. Thank you!

Britt-Marie Falk, my dear colleague during all the years, we once started the public health work together and shared all the ups and downs throughout the years, thanks for all the fruitful chats.

Colleagues at the Public Health unit and R&D Kronoberg, thanks for fruitful discussions, nice coffee breaks, supportive cheers and close cooperation, that I really appreciate from all of you!

All "inspirers" from A Non Smoking Generation, who throughout the years have contributed to the striving towards a goal of a tobacco-free generation – at least in the Kronoberg County.

All the school nurses involved in the Kronoberg County – and there are many of you! Thanks for all your help and patience with the distribution of questionnaires to pupils throughout the years.

Thanks to all the thousands of pupils who have signed up and completed several questionnaires and allowed themselves to be interviewed and shared their lives, how they perceive their health and health behaviour. Without your participation there had been no results to analyse and write about.

Friends and colleges in the "Tobacco Prevention in County Councils and Regions" (TPLR) and colleagues in SmT – Swedish Nurses Against Tobacco. Thanks to everyone who came and went in all the years for shared experiences and inspiration and support for the work with tobacco prevention, thanks for your energy and inspiration.

Financial support from The County Council in Kronoberg, Region Skåne, and The Swedish National Institute of Public Health. Cancerstiftelsen, which who gave me a scholarship, at an early stage of my research education. Thanks to this financial aid, I have been able to conduct my studies without too much stress.

My family: In memory of my father, Olle, how taught me not to worry about things until it is necessary. Maria, my mother, who has taught me to try new step in life to reach new goals and try something new.

And my last thanks are for my dear, dear family, Stig, Johanna and Oscar – you are the sunshine of my life! Thank you for all your support, care and love! You mean everything to me.

References

1. World Health Organization. Regional Office for Europe., Health Evidence Network (Europe). Which are the most effective and cost-effective interventions for tobacco control? To what extent does an increase in tobacco prices lead to a significant reduction in consumption? What other possible implications will an increase of tobacco prices have? Copenhagen: WHO Regional Office for Europe; 2003. 17 p. p.

2. Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. BMJ. 2004;328(7455):1519. Epub 2004/06/24.

3. Doll R, Hill AB. Smoking and carcinoma of the lung; preliminary report. Br Med J. 1950;2(4682):739-48.

4. United States. Department of health education and welfare. Public health service. Smoking and health : report of the advisory committee to the surgeon general of the Public health service. Washington: Van Nostrand; 1964. 387 p.

5. Lopez A, Collishaw N, Piha T. A descriptive model of the cigarette epidemic in developed countries. Tobacco Control. 1994;3:242-7.

6. Mackay J, Eriksen MP, Ross H. The tobacco atlas. 4th ed. Atlanta, Ga.: American Cancer Society; 2012.

7. Statens Folkhälsoinstitut. Nationella folkhälsoenkäten: Hälsa på lika villkor. 2011; Available from: http://www.fhi.se/Statistik-uppfoljning/Nationella-folkhalsoenkaten/.

8. Alkherayf F, Wai EK, Tsai EC, Agbi C. Daily smoking and lower back pain in adult Canadians: the Canadian Community Health Survey. Journal of pain research. 2010;3:155-60. Epub 2011/01/05.

9. U.S. Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2012.: 2012.

10. Commission E. Health Effects of Smokeless Tobacco Products. 2008.

11. Grotvedt L, Forsen L, Stavem K, Graff-Iversen S. Patterns of snus and cigarette use: a study of Norwegian men followed from age 16 to 19. Tob Control. 2012. Epub 2012/05/29.

12. Galanti MR, Rosendahl I, Wickholm S. The development of tobacco use in adolescence among "snus starters" and "cigarette starters": an analysis of the Swedish "BROMS" cohort. Nicotine Tob Res. 2008;10(2):315-23.

13. Boffetta P, Straif K. Use of smokeless tobacco and risk of myocardial infarction and stroke: systematic review with meta-analysis. Bmj. 2009;339:b3060.

14. Cnattingius S, Statens folkhälsoinstitut, Karolinska institutet. Hälsorisker med svenskt snus. Stockholm: Statens folkhälsoinstitut : Karolinska institutet; 2005. 111 bl. p.

15. Hergens MP, Alfredsson L, Bolinder G, Lambe M, Pershagen G, Ye W. Long-term use of Swedish moist snuff and the risk of myocardial infarction amongst men. J Intern Med. 2007;262(3):351-9.

16. England LJ, Levine RJ, Mills JL, Klebanoff MA, Yu KF, Cnattingius S. Adverse pregnancy outcomes in snuff users. Am J Obstet Gynecol. 2003;189(4):939-43.

17. Wikstrom AK, Cnattingius S, Stephansson O. Maternal use of Swedish snuff (snus) and risk of stillbirth. Epidemiology. 2010;21(6):772-8.

18. Baba S, Wikstrom AK, Stephansson O, Cnattingius S. Influence of smoking and snuff cessation on risk of preterm birth. European journal of epidemiology. 2012. Epub 2012/03/21.

19. Persson PG, Carlsson S, Svanstrom L, Ostenson CG, Efendic S, Grill V. Cigarette smoking, oral moist snuff use and glucose intolerance. J Intern Med. 2000;248(2):103-10.

20. Norberg M, Stenlund H, Lindahl B, Boman K, Weinehall L. Contribution of Swedish moist snuff to the metabolic syndrome: a wolf in sheep's clothing? Scand J Public Health. 2006;34(6):576-83.

21. Heir T, Eide G. Injury proneness in infantry conscripts undergoing a physical training programme: smokeless tobacco use, higher age, and low levels of physical fitness are risk factors. Scand J Med Sci Sports. 1997;7(5):304-11.

22. Galanti MR, Wickholm S, Gilljam H. Between harm and dangers. Oral snuff use, cigarette smoking and problem behaviours in a survey of Swedish male adolescents. Eur J Public Health. 2001;11(3):340-5.

23. Simon TR SS, Dent CW, Burton D, Flay BR. Correlates of Exclusive or combined use of cigarettes and smokeless tobacco among male adolescents. Addictive Behaviours. 1993;18:623-34.

24. Wickholm S GM, Söder B, Gilljam H. Cigarett smoking, snuff use and alcohol drinking: coexisting risk behaviours for oral health in young males. Community Dentistry and Oral Epidemiology. 2003;31:269-74.

25. World Health Organization. WHO Framework Convention on Tobacco Control. Geneva: World Health Organization; 2003. 36 p. p.

26. En förnyad folkhälsopolitik. Regeringens proposition 2007/08:110. Stockholm: Socialdepartementet 2008. p. 122.

27. Currie C, Zanotti C, Morgan A, Roberts C, Currie D, Looze Md, et al. Social determinants of health and well-being among young people : Health Behaviour in School-aged Children (HBSC) international report from the 2009/2010 survey. Copenhagen: WHO Regional Office for Europe; 2012. xviii + 252 p. p.

28. Henriksson C, Leifman H. Skolelevers drogvanor. Stockholm: Centralförbundet för alkohol- och narkotikaupplysning; 2011. 1 PDF-fil (260) p.

29. Edvardsson I, Lendahls L, Hakansson A. When do adolescents become smokers? Annual seven-year population-based follow-up of tobacco habits among 2000 Swedish pupils--an open cohort study. Scand J Prim Health Care. 2009;27(1):41-6.

30. Perry CL. The tobacco industry and underage youth smoking: tobacco industry documents from the Minnesota litigation. Arch Pediatr Adolesc Med. 1999;153(9):935-41. Epub 1999/09/11.

31. Germain D, Wakefield MA, Durkin SJ. Adolescents' perceptions of cigarette brand image: does plain packaging make a difference? J Adolesc Health. 2010;46(4):385-92. Epub 2010/03/24.

32. Moodie C, Stead M, Bauld L, Mc Neill A, Angus K, Hinds K, et al. Plain Tobacco Packaging: A Systematic Review. UK Centre for Tobacco Control Studies: University of Stirling, 2012.

33. Edvardsson I, Hakansson A. Development of schoolchildren's smoking habits: questionnaire studies in intervention and control groups. Acta Paediatr. 2000;89(10):1257-61.

34. Breslau N, Peterson EL. Smoking cessation in young adults: age at initiation of cigarette smoking and other suspected influences. Am J Public Health. 1996;86(2):214-20.

35. Surgeon G. Preventing tobacco use among young people. A report of the surgeon general : executive summary. Atlanta, GA,: Rockville, MD, US Department of Health and Human Services. Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health 1994.

36. Gervais A, O'Loughlin J, Meshefedjian G, Bancej C, Tremblay M. Milestones in the natural course of onset of cigarette use among adolescents. CMAJ : Canadian Medical Association journal = journal de l'Association medicale canadienne. 2006;175(3):255-61. Epub 2006/08/02.

37. DiFranza JR, Savageau JA, Rigotti NA, Fletcher K, Ockene JK, McNeill AD, et al. Development of symptoms of tobacco dependence in youths: 30 month follow up data from the DANDY study. Tob Control. 2002;11(3):228-35.

38. Post A, Gilljam H, Rosendahl I, Bremberg S, Galanti MR. Symptoms of nicotine dependence in a cohort of Swedish youths: a comparison between smokers, smokeless tobacco users and dual tobacco users. Addiction. 2010;105(4):740-6.

39. DiFranza JR, Savageau JA, Fletcher K, Ockene JK, Rigotti NA, McNeill AD, et al. Measuring the loss of autonomy over nicotine use in adolescents: the DANDY (Development and Assessment of Nicotine Dependence in Youths) study. Arch Pediatr Adolesc Med. 2002;156(4):397-403.

40. Hooshmand S, Willoughby T, Good M. Does the direction of effects in the association between depressive symptoms and health-risk behaviors differ by behavior? A longitudinal study across the high school years. J Adolesc Health. 2012;50(2):140-7. Epub 2012/01/24.

41. Doubeni CA, Reed G, Difranza JR. Early course of nicotine dependence in adolescent smokers. Pediatrics. 2010;125(6):1127-33.

42. Sherva R, Wilhelmsen K, Pomerleau CS, Chasse SA, Rice JP, Snedecor SM, et al. Association of a single nucleotide polymorphism in neuronal acetylcholine receptor subunit alpha 5 (CHRNA5) with smoking status and with 'pleasurable buzz' during early experimentation with smoking. Addiction. 2008;103(9):1544-52. Epub 2008/09/12.

43. Rogers JM. Tobacco and pregnancy: overview of exposures and effects. Birth defects research Part C, Embryo today : reviews. 2008;84(1):1-15. Epub 2008/04/03.

44. Rydell M, Cnattingius S, Granath F, Magnusson C, Galanti MR. Prenatal exposure to tobacco and future nicotine dependence: population-based cohort study. The British journal of psychiatry : the journal of mental science. 2012;200:202-9. Epub 2012/02/11.

45. Bricker JB, Peterson AV, Jr., Leroux BG, Andersen MR, Rajan KB, Sarason IG. Prospective prediction of children's smoking transitions: role of parents' and older siblings' smoking. Addiction. 2006;101(1):128-36.

46. Harakeh Z, Scholte RH, Vermulst AA, de Vries H, Engels RC. Parental factors and adolescents' smoking behavior: an extension of The theory of planned behavior. Prev Med. 2004;39(5):951-61. Epub 2004/10/12.

47. Leonardi-Bee J, Jere ML, Britton J. Exposure to parental and sibling smoking and the risk of smoking uptake in childhood and adolescence: a systematic review and meta-analysis. Thorax. 2011;66(10):847-55. Epub 2011/02/18.

48. Melchior M, Chastang JF, Mackinnon D, Galera C, Fombonne E. The intergenerational transmission of tobacco smoking--the role of parents' long-term smoking trajectories. Drug and alcohol dependence. 2010;107(2-3):257-60. Epub 2009/12/17.

49. Rosendahl KI, Galanti MR, Gilljam H, Ahlbom A. Smoking mothers and snuffing fathers: behavioural influences on youth tobacco use in a Swedish cohort. Tob Control. 2003;12(1):74-8.

50. Jackson C, Dickinson D. Enabling parents who smoke to prevent their children from initiating smoking: results from a 3-year intervention evaluation. Arch Pediatr Adolesc Med. 2006;160(1):56-62. Epub 2006/01/04.

51. Tucker JS, Edelen MO, Go MH, Pollard MS, Green HD, Jr., Kennedy DP. Resisting Smoking When a Best Friend Smokes: Do Intrapersonal and Contextual Factors Matter? Journal of research on adolescence : the official journal of the Society for Research on Adolescence. 2012;22(1):113-22. Epub 2012/03/06.

52. Nilsson M, Weinehall L, Bergstrom E, Stenlund H, Janlert U. Adolescent's perceptions and expectations of parental action on children's smoking and snus use; national cross sectional data from three decades. BMC Public Health. 2009;9:74.

53. Sargent JD DM. Does Parental disapproval of smoking prevent adolescents from becoming established smokers? Pediatrics. 2001;108:1256-62.

54. Tilson EC, McBride CM, Lipkus IM, Catalano RF. Testing the interaction between parent-child relationship factors and parent smoking to predict youth smoking. J Adolesc Health. 2004;35(3):182-9. Epub 2004/08/18.

55. Ali MM, Dwyer DS. Estimating peer effects in adolescent smoking behavior: a longitudinal analysis. J Adolesc Health. 2009;45(4):402-8. Epub 2009/09/22.

56. Bricker JB, Peterson AV, Jr., Andersen MR, Rajan KB, Leroux BG, Sarason IG. Childhood friends who smoke: do they influence adolescents to make smoking transitions? Addict Behav. 2006;31(5):889-900. Epub 2005/08/16.

57. Karp I, O'Loughlin J, Paradis G, Hanley J, Difranza J. Smoking trajectories of adolescent novice smokers in a longitudinal study of tobacco use. Annals of epidemiology. 2005;15(6):445-52. Epub 2005/06/22.

58. Wetzels JJ, Kremers SP, Vitoria PD, de Vries H. The alcohol-tobacco relationship: a prospective study among adolescents in six European countries. Addiction. 2003;98(12):1755-63.

59. Stanton WR, Flay BR, Colder CR, Mehta P. Identifying and predicting adolescent smokers' developmental trajectories. Nicotine Tob Res. 2004;6(5):843-52. Epub 2005/02/11.

60. Burt RD, Dinh KT, Peterson AV, Jr., Sarason IG. Predicting adolescent smoking: a prospective study of personality variables. Prev Med. 2000;30(2):115-25. Epub 2000/02/05.

61. Sonntag H, Wittchen HU, Hofler M, Kessler RC, Stein MB. Are social fears and DSM-IV social anxiety disorder associated with smoking and nicotine dependence in adolescents and young adults? European psychiatry : the journal of the Association of European Psychiatrists. 2000;15(1):67-74. Epub 2000/03/14.

62. Marmot M. Status syndrome : how your social standing directly affects your health and life expectancy. London: Bloomsbury; 2004. 311 s. p.

63. Graham H. Women's smoking and family health. Soc Sci Med. 1987;25(1):47-56. Epub 1987/01/01.

64. de Vries H, Candel M, Engels R, Mercken L. Challenges to the peer influence paradigm: results for 12-13 year olds from six European countries from the European Smoking Prevention Framework Approach study. Tob Control. 2006;15(2):83-9. Epub 2006/03/28.

65. Conrad KM, Flay BR, Hill D. Why children start smoking cigarettes: predictors of onset. Br J Addict. 1992;87(12):1711-24.

66. Tajfel H, Turner JC. The social identity theory of inter-group behavior. Chicago: Nelson-Hall: Psychology of Intergroup Relations. Chicago: Nelson-Hall 1986.

67. Tajfel H. Social identity and intergroup relations. Cambridge Cambridgeshire ; New York Paris: Cambridge University Press; Editions de la maison des sciences de l'homme; 1982. xv, 528 p. p.

68. Wrangsjö B, Winberg Salomonsson M. Tonårstid : utveckling, problem och psykoterapeutisk behandling. 1. utg. ed. Stockholm: Natur och Kultur; 2006. 396, [1] p.

69. Sussman S, Pokhrel P, Ashmore RD, Brown BB. Adolescent peer group identification and characteristics: a review of the literature. Addict Behav. 2007;32(8):1602-27. Epub 2006/12/26.

70. Ajzen I. The theory of planned behavior. Organizational Behavior and Human Decision Processes. 1991;Vol.50(2):pp.

71. Smith BN, Bean MK, Mitchell KS, Speizer IS, Fries EA. Psychosocial factors associated with non-smoking adolescents' intentions to smoke. Health education research. 2007;22(2):238-47. Epub 2006/08/02.

72. Bleakley A, Hennessy M, Fishbein M, Jordan A. Using the Integrative Model to explain how exposure to sexual media content influences adolescent sexual behavior. Health education & behavior : the official publication of the Society for Public Health Education. 2011;38(5):530-40. Epub 2011/05/25.

73. Clift S, Bruun Jensen B, World Health Organization. Regional Office for Europe. The health promoting school : international advances in theory, evaluation and practice. Copenhagen: Danish University of Education Press; 2005. 515 p. p.

74. Jha PKS, Chaloupka FJ. Curbing the epidemic : governments and the economics of tobacco control. Washington, D.C.: World Bank; 1999. 122 p. p.

75. Sundh M, Hagquist C. Does a minimum-age law for purchasing tobacco make any difference? Swedish experiences over eight years. Eur J Public Health. 2007;17(2):171-7. Epub 2006/08/05.

76. DiFranza JR, Dussault GF. The federal initiative to halt the sale of tobacco to children--the Synar Amendment, 1992-2000: lessons learned. Tob Control. 2005;14(2):93-8. Epub 2005/03/26.

77. Gilpin EA, Lee L, Pierce JP. Does adolescent perception of difficulty in getting cigarettes deter experimentation? Prev Med. 2004;38(4):485-91. Epub 2004/03/17.

78. Statens folkhälsoinstitut. Tonåringar om tobak : vanor, kunskaper och attityder. Stockholm: Statens folkhälsoinstitut; 2010. 97 s. p.

79. World Health Organization. WHO technical manual on tobacco tax administration. Geneva: World Health Organization, 2010 92-4-156399-0978-92-4-156399-4.

80. Ross H, Chaloupka FJ. The effect of cigarette prices on youth smoking. Health economics. 2003;12(3):217-30. Epub 2003/02/28.

81. Ding A. Curbing adolescent smoking: a review of the effectiveness of various policies. The Yale journal of biology and medicine. 2005;78(1):37-44. Epub 2005/10/04.

82. Pierce JP, White VM, Emery SL. What public health strategies are needed to reduce smoking initiation? Tob Control. 2012;21(2):258-64. Epub 2012/02/22.

83. Aveyard P, Markham WA, Cheng KK. A methodological and substantive review of the evidence that schools cause pupils to smoke. Soc Sci Med. 2004;58(11):2253-65. Epub 2004/03/30.

84. Wiehe SE, Garrison MM, Christakis DA, Ebel BE, Rivara FP. A systematic review of school-based smoking prevention trials with long-term follow-up. J Adolesc Health. 2005;36(3):162-9. Epub 2005/03/02.

85. Backinger CL, Fagan P, Matthews E, Grana R. Adolescent and young adult tobacco prevention and cessation: current status and future directions. Tob Control. 2003;12 Suppl 4:IV46-53. Epub 2003/12/03.

86. Skara S, Sussman S. A review of 25 long-term adolescent tobacco and other drug use prevention program evaluations. Prev Med. 2003;37(5):451-74. Epub 2003/10/24.

87. Moore L, Roberts C, Tudor-Smith C. School smoking policies and smoking prevalence among adolescents: multilevel analysis of cross-sectional data from Wales. Tob Control. 2001;10(2):117-23. Epub 2001/06/02.

88. Evans-Whipp T, Beyers JM, Lloyd S, Lafazia AN, Toumbourou JW, Arthur MW, et al. A review of school drug policies and their impact on youth substance use. Health promotion international. 2004;19(2):227-34. Epub 2004/05/07.

89. Pinilla J, Gonzalez B, Barber P, Santana Y. Smoking in young adolescents: an approach with multilevel discrete choice models. J Epidemiol Community Health. 2002;56(3):227-32. Epub 2002/02/21.

90. Rökfria skolgårdar och en tobaksfri skoltid. Östersund: Statens Folkhälsoinstitut; 2011.

91. Holm Ivarsson B, Statens folkhälsoinstitut. Tobak och avvänjning : en faktaskrift om tobakens skadeverkningar och behovet av tobaksavvänjning /[författare: Barbro Holm-Ivarsson]. Rev. uppl. ed. Östersund: Statens folkhälsoinstitut; 2009. 124 s. p.

92. Grimshaw GM, Stanton A. Tobacco cessation interventions for young people. Cochrane Database Syst Rev. 2006(4):CD003289.

93. WHO. Ottawa charter for health promotion. Can J Public Health. 1986;77(6):425-30.

94. Naidoo J, Wills J. Foundations for health promotion. 3rd ed. Edinburgh ; New York: Elsevier; 2009.

95. Downie RS, Tannahill C, Tannahill A. Health promotion : models and values. 2 rev. ed. Oxford: Oxford Univ. Press; 1996. 218 p.

96. Bauer G, Davies JK, Pelikan J. The EUHPID Health Development Model for the classification of public health indicators. Health promotion international. 2006;21(2):153-9. Epub 2006/01/13.

97. Antonovsky A. Unraveling the mystery of health : how people manage stress and stay well. 1. ed. San Francisco, Calif.: Jossey-Bass; 1987. 218 p.

98. von Bothmer M, Fridlund B. Promoting a tobacco-free generation: who is responsible for what? J Clin Nurs. 2001;10(6):784-92.

99. Scal P, Ireland M, Borowsky IW. Smoking among American adolescents: a risk and protective factor analysis. Journal of community health. 2003;28(2):79-97. Epub 2003/04/23.

100. Kreuger RA, Casey, M Focus Groups. A Practical Guide for Applied Research. 3rd ed. 3rd ed. ed. Thousand Oaks, California Sage Publications Inc; 2000.

101. Wibeck V. Fokusgrupper : om fokuserade gruppintervjuer som undersökningsmetod. Lund: Studentlitteratur; 2000. 144 s. p.

102. Andersson B, Hibell B, Centralförbundet för alkohol- och narkotikaupplysning. Skolelevers drogvanor : tabeller med sammanfattande kommentarer. 1993. Stockholm: Centralförbundet för alkohol- och narkotikaupplysning (CAN); 1993. 145 s. p.

103. Currie C, University of Edinburgh. Child & Adolescent Health Research Unit, Health Behaviour in School-aged Children (Network), World Health Organization. Regional Office for Europe. Inequalities in young people's health HBSC international report from the 2005/2006 survey. Copenhagen: World Health Organization, 2008.

104. Roberts C, Freeman J, Samdal O, Schnohr CW, de Looze ME, Nic Gabhainn S, et al. The Health Behaviour in School-aged Children (HBSC) study: methodological developments and current tensions. International journal of public health. 2009;54 Suppl 2:140-50. Epub 2009/07/30.

105. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. Nurse Educ Today. 2004;24(2):105-12.

106. Polit DF, Hungler BP. Nursing research : principles and methods. 6. ed. Philadelphia: Lippincott Williams & Wilkins; 1999. 756 s. p.

107. WMA Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects [database on the Internet]. The World Medical Association (WMA). 2008.

108. Nilsson M, Stenlund H, Bergstrom E, Weinehall L, Janlert U. It takes two: reducing adolescent smoking uptake through sustainable adolescent-adult partnership. J Adolesc Health. 2006;39(6):880-6.

109. Rosendahl KI, Galanti MR, Gilljam H. Trajectories of smokeless tobacco use and of cigarette smoking in a cohort of Swedish adolescents: differences and implications. Nicotine Tob Res. 2008;10(6):1021-7.

110. Difranza JR, Sweet M, Savageau JA, Ursprung WW. The assessment of tobacco dependence in young users of smokeless tobacco. Tob Control. 2011.

111. Hedman L B-BA, Perzanowski M, Sundberg S, Rönmark E. Factors related to tobacco use among teenagers. Respiratory Medicine. 2006;101:496-502.

112. Naidoo J, Wills J, Larsson-Wentz K. Folkhälsa och hälsofrämjande insatser. Lund: Studentlitteratur; 2007. 412 s. p.

113. Bricker JB AM, Rajan KB, Sarason IG Peterson Jr AV. The role of schoolmates´smoking and non-smoking in adolescents´ smoking transitions: a longitudinal study. Addiction. 2007;102:1665-75.

114. Hoffman BR, Sussman S, Unger JB, Valente TW. Peer influences on adolescent cigarette smoking: a theoretical review of the literature. Substance use & misuse. 2006;41(1):103-55. Epub 2006/01/06.

115. Paulus P. 20 Years of Health Promotion Research in and on Settings i Europe - the case of School Promotion. Italian Journal of Public Health. 2007;4:248-54.

116. Starrin B, Svensson P-G. Kvalitativ metod och vetenskapsteori. Lund: Studentlitteratur; 1994. 211 s. p.

117. Post A GH, Rosendahl I, Meuling L, Bremberg s, Galanti MR. Validity of self reports in a cohort of Swedish adolescent smokers and smokeless tobacco (snus) users. Tobacco Control. 2005;14:114-7.

118. Bancej C, O'Loughlin J, Platt RW, Paradis G, Gervais A. Smoking cessation attempts among adolescent smokers: a systematic review of prevalence studies. Tob Control. 2007;16(6):e8.

119. Haukkala A, Vartiainen E, H Vd. Progression of oral snuff use among Finnish 13-16-year-old students and its relation to smoking behaviour. Addicion. 2006;101: 581-9.

120. Ejlertsson G, Eden L, Leden I. Predictors of positive health in disability pensioners: a population-based questionnaire study using Positive Odds Ratio. BMC Public Health. 2002;2:20.

Paper I

Acta Pædiatr 89: 1257–61. 2000

Development of schoolchildren's smoking habits: questionnaire studies in intervention and control groups

I Edvardsson[1] and A Håkansson[2]

Kronoberg County Council[1], Växjö and Department of Community Medicine[2], Malmö University Hospital, Malmö, Sweden

Edvardsson I, Håkansson A. Development of schoolchildren's smoking habits: questionnaire studies in intervention and control groups. Acta Pædiatr 2000; 89: 1257–61. Stockholm. ISSN 0803–5253

The objective of the present study was to describe the development of smoking from the sixth grade (age 12) to the eighth (age 14), for girls and for boys, and to study the effect of a simple anti-smoking intervention carried out in the sixth grade. All the roughly 2000 schoolchildren in Kronoberg County, born in 1982, completed an annual anonymous classroom questionnaire on smoking habits in the years 1994–96. In 1994, there were two visits, each lasting 80 min, by a campaigner from A Non-Smoking Generation to the 59 schools which opted for intervention, and no visits to the 21 schools which declined intervention. Before the intervention there were no differences in the frequency of smokers between the intervention group and the control group. In 2 y the proportion of smokers then rose among the girls from 1% to 12% and among the boys from 2% to 7%. Two years after the intervention, the proportion of smokers in the intervention group was approximately two-thirds of that in the control group. When the statistical analysis was based on the individual pupils, the difference between the two groups was statistically significant, but if the schools were used as the unit of analysis, the result was non-significant.

Even a small-scale intervention may have an effect on the development of smoking among schoolchildren, but other preventive measures in the schools probably also contributed to the positive development of smoking in the intervention group.

Key words: *Adolescence, gender, intervention, smoking*

A Håkansson, Department of Community Medicine, Malmö University Hospital, SE-205 02 Malmö, Sweden (Tel. +46 40 332669, fax. +46 40 333402, e-mail. anders.hakansson@smi.mas.lu.se)

Schoolchildren's smoking habits

The latest WHO study of schoolchildren's health habits charted smoking habits among pupils aged 11, 13 and 15 y (1). The Swedish children ended up in the middle of the 20 or so countries included in the study, but compared with Western Europe alone young Swedes smoked much less than average. More girls than boys smoked in the west, while the reverse was the case in Eastern Europe.

Since 1971 there have been regular questionnaire studies in Sweden concerning schoolchildren's smoking habits in the sixth and ninth grades (2). In the first study of 16-y-olds, 41% of the boys and 47% of the girls stated that they smoked (2). After this there was a heavy decline in smoking, and the proportion of smokers was lowest in the mid-1980s, after which the frequency of smoking increased a little, before levelling out again in the 1990s. The spring 1997 investigation found that 17% of the boys and 25% of the girls smoked, and the 1999 study showed similar results.

Every other year a corresponding study is made of 12-y-olds, where the proportion of smokers is usually around 4% (2). Many young Swedes thus begin to smoke between the ages of 12 and 16.

A Swedish study from the beginning of the 1990s (3) found around 3% daily smokers in the seventh grade compared with around 15% in the ninth grade. In a recently published study from the city of Gothenburg (4), only a few (3–7%) adolescents smoked daily in grade 7, but many started somewhere between grade 7 and grade 9. In both studies, there were more smokers among girls than among boys; the study method used was an anonymous classroom questionnaire.

Each week almost 500 children and young people in Sweden start smoking (5). The use of tobacco is usually established in the teens, with the quickest increase occurring at age 14–15. Nine out of 10 start to smoke before the age of 20 (6).

A British study has shown that 80% of all teenagers who regularly smoke continue to smoke when they become adults (7). Starting at an early age also means higher consumption as an adult than when people start later in their teens.

On average it takes a couple of years after first experimenting until people become dependent and

 ISSN 0803-5253

Table 1. Description of the studied intermediate level (grades 4–6) schools in Kronoberg County in 1994, and comparison between the intervention group and the control group.

	No. (percentage)		
	Intervention group	Control group	All schools
No. of schools	59	21	80
Mean no. of pupils (6th grade) per school	28.3	16.5	25.2
Urban schools	16 (27%)	3 (14%)	19 (24%)
Rural schools	43 (73%)	18 (86%)	61 (76%)
20 or fewer pupils	21 (36%)	13 (62%)	34 (43%)
21 or more pupils	38 (64%)	8 (38%)	46 (57%)
No. of classes (6th grade)	80	22	102
Mean no. of pupils (6th grade) per class	20.9	15.7	19.8

hence compulsive smokers (8). Most young smokers do not identify themselves as smokers, they have not made up their minds to become smokers, and they are not aware that they are becoming addicted to nicotine; they think that they are just casual smokers.

Smoking intervention in school

The first reports about the harmful effects of smoking came in the mid-1960s. It was then considered a matter of urgency to give schoolchildren information and knowledge that would persuade them not to start smoking, but despite this the smoking habits of young people did not change (9). During subsequent decades, various methods and health-promotion activities were tested to influence children and young people never to start smoking.

In Finland, a method based on behavioural science has been used, a method similar to that used by A Non-Smoking Generation in Sweden. Follow-up studies show that long-term effects of tobacco prevention can be achieved if school intervention is combined with intervention in society and the mass media, but that the positive effects wear off with time (10, 11).

In Norway, positive short-term effects have been noted after a relatively comprehensive intervention programme in schools, aimed at grades 6–9 (12), but the long-term effects have not yet been studied.

There are studies emphasizing the importance of repeating the message each year over the course of several years in school in order to achieve the best effect (13). Better and lasting results are achieved when there is good support for these measures in school and when they are reinforced in society by other tobacco-prevention activities (14–16).

In a newly published randomized and controlled study from England (17), it was not possible to demonstrate any effect of a large-scale intervention in getting 13 to 14-y-olds to remain non-smokers or to stop smoking.

Objective

The overall objective of our study was to follow the development of smoking habits in a youth cohort over a number of years. In this article we aim to describe the development of smoking habits from the sixth to the eighth grade, for girls and for boys, and to study any effects of a simple anti-smoking intervention carried out in the sixth grade.

Subjects and methods

Study area

Kronoberg County in southern Sweden has a population of just over 180000. Växjö is the largest of eight municipalities, with more than 70000 inhabitants, and Ljungby is the second largest, with almost 30000 inhabitants. In the urban parts of Växjö and Ljungby there are 50000 and 15000 inhabitants, respectively. There are thus 115000 people living in the rural part of the county.

There are 80 schools at intermediate level (grades 4–6), 19 urban and 61 rural (Table 1). In 1994, only one of the urban schools had fewer than 20 pupils in the sixth grade, compared with 33 of the rural schools. There are also 20 upper-level schools in the county (grades 7–9).

Questionnaire in 1994

In the autumn term 1994 a questionnaire study was carried out at 80 schools with a total of 102 classes in the sixth grade. A total of 2179 questionnaires were distributed to all the pupils born in 1982. A total of 2015 responded, i.e. a rate of 92.5%.

The questionnaires were sent to the school nurses, who distributed them to the pupils via the class teachers. The forms were completed anonymously by the pupils in the classroom during school hours. The questions about tobacco were taken from a national survey on drug habits (2), which is sent to Swedish pupils in the ninth grade every year and to pupils in the sixth grade every other year. The main question was: "Do you smoke?", and the possible answers were "Yes"; "No, I have stopped smoking"; "No, but I have tried smoking"; and "No, I have never smoked".

Intervention

After this, each school was offered a visit from A Non-Smoking Generation, represented by a campaigner

Table 2. Development of smoking habits, for girls and boys, from the sixth grade (in 1994) to the eighth grade (in 1996). *Epi-Info* has been used to calculate relative risk (RR) values with 95% confidence intervals (CI).

	Percentage				*Girls vs. boys* RR (95% CI)	
	Current smoking	Stopped smoking	Tried smoking	Never smoked	Current	Never
Grade 6						
Girls (n = 952)	0.9	1.9	26.7	70.5	0.48	1.27
Boys (n = 1063)	2.0	3.1	39.4	55.5	(0.22–1.04)	(1.19–1.36)
Grade 7						
Girls (n = 977)	3.2	3.2	32.4	61.2		
Boys (n = 1057)	2.3	1.8	41.6	54.3		
Grade 8						
Girls (n = 955)	12.1	3.9	37.3	46.7	1.78	1.00
Boys (n = 1015)	6.7	3.2	43.6	46.6	(1.33–2.37)	(0.91–1.10)
Grade 8 vs grade 6						
Girls						
RR (95% CI)	12.41 (6.33–24.32)			0.66 (0.61–0.71)		
Boys						
RR (95% CI)	3.34 (2.06–5.41)			0.84 (0.77–0.91)		

known as an "inspirer", a young person in his or her twenties, specially trained in tobacco issues. Eighty classes, distributed in 59 schools, accepted, while 21 schools declined this offer (Table 1).

In the school year 1994–95, the 80 classes each had two 80-min visits from the campaigner at intervals of 2–3 wk. Through discussions of self-confidence, courage and group pressure, as well as evaluation exercises and role-play, the campaigner tried to get the pupils to choose a tobacco-free life of their own accord.

Questionnaires in 1995 and 1996

In the autumn term 1995 a new questionnaire was distributed to the same pupils, now in the seventh grade. The same questions as before were used, along with four additional questions, one of which concerned whether the pupil had received information from A Non-Smoking Generation. The questionnaires were distributed in the same way as in the preceding year, to 20 upper-level schools with 87 classes. Of 2186 questionnaires, 2034 were completed, giving a response frequency of 93.0%.

In the autumn term 1996, when the pupils were in the eighth grade, a further questionnaire study was conducted with the same questions as the year before. This time the pupils had to state which school they had attended 2 y previously (in the sixth grade). The questionnaires were distributed in the same way as before to the 20 upper-level schools with their 87 classes. A total of 2188 questionnaires were distributed and 1985 were completed, giving a response frequency of 90.7%.

Statistical methods

Epi-Info version 6 was used for statistical calculations. Relative risk values with Taylor series 95% confidence limits were used for most comparisons. In one case the Mantel-Haenszel weighted relative risk was calculated with 95% Greenland/Robbins confidence limits, and another comparison was done with the aid of the Mann-Whitney U-test.

Results

Girls versus boys

Table 2 gives smoking development from the sixth to the eighth grade. Fewer girls than boys in the sixth grade smoked, and more girls had never smoked, whereas in the eighth grade there were more smokers among the girls, and the proportion who had never smoked was equally large among girls and boys.

During the 2 y that elapsed between the surveys, the percentage of smoking girls had multiplied by more than 12, while the proportion of smoking boys had more than tripled (Table 2).

Of those in the eighth grade who said that they smoked or had stopped smoking, 64% believed that they would be smokers at the age of 20, while the corresponding figure for those who had tried smoking or had never smoked was just under 5%. From the sixth to the eighth grade, snuff use increased among the boys from 0.6% to 6.2%, and among girls from 0.2% to 0.3%.

Intervention versus control-analyses based on pupils

Table 3 compares the development of smoking for pupils who had been visited by A Non-Smoking Generation with those who were not. Whereas the two groups of sixth-grade pupils did not show any differences in the proportions of those who smoked and those who had never smoked, in the eighth grade there was a lower risk of smoking and a greater chance of non-smoking among the pupils who had been exposed to intervention compared with the other pupils. This analysis, based on the individual pupils, thus gave a statistically significant outcome as regards the effect of intervention.

Table 3. Development of smoking habits in intervention and control groups, respectively, from the sixth grade (in 1994) to the eighth grade (in 1996). *Epi-Info* has been used to calculate relative risk (RR) values with 95% confidence intervals (CI). (In 1996, 15 pupils did not state which school they had attended in 1994.)

	Percentage				*Intervention vs control* RR (95% CI)	
	Current smoking	Stopped smoking	Tried smoking	Never smoked	Current	Never
Grade 6						
Interv. (n = 1669)	1.6	2.4	33.0	63.0	1.35	1.04
Control (n = 346)	1.2	3.2	35.3	60.4	(0.47–3.84)	(0.95–1.15)
Grade 8						
Interv. (n = 1602)	8.4	2.9	40.6	48.1	0.66	1.18
Control (n = 353)	12.7	5.9	40.6	40.8	(0.48–0.90)	(1.03–1.35)
Grade 8 vs. grade 6						
Intervention group						
RR (95% CI)	5.37 (3.55–8.13)			0.76 (0.72–0.81)		
Control group						
RR (95% CI)	11.03 (4.01–30.33)			0.68 (0.58–0.79)		

From 1994 to 1996, the percentage of smokers had multiplied by five in the intervention group and by 11 in the control group, while the proportion of never smokers was reduced by one-fourth and one-third, respectively (Table 3).

The proportion of smoking girls increased from 0.8% to 11.0% in the intervention group, and from 1.8% to 15.7% in the control group. The corresponding changes for the boys were 2.3% to 5.9% and 0.6% to 10.1%, respectively.

Intervention versus control-analyses based on schools

For the 59 schools which had been visited by A Non-Smoking Generation, the Mantel-Haenszel weighted relative risk for current smoking was 5.2 (95% Greenland/Robbins confidence limits 3.4–7.9) in the eighth grade compared with the sixth grade, and for the 20 schools which had not been visited it was 11.1 (3.9–31.6). (In this and the following analysis one small school with only seven pupils in the sixth grade was excluded.) This means that smoking during the 2 y had increased approximately fivefold in the schools which had been visited by A Non-Smoking Generation, compared with an elevenfold increase in the other schools. The latter confidence interval in particular was very broad.

With the aid of the Mann-Whitney U-test, the change in the percentage of current smokers from the sixth to the eighth grade for the 59 schools which were visited by A Non-Smoking Generation was compared with the corresponding change in the 20 schools which had not been visited. The result was a z-value of 1.18, equivalent to a p-value of 0.24. This conservative analysis, with the schools as the unit of analysis, thus gave a non-significant outcome.

Discussion

We have studied the effects of a simple anti-smoking intervention aimed at schoolchildren aged 12. Before the intervention there was no difference in smoking frequency between the group which was subsequently visited by A Non-Smoking Generation and the group that was not visited. Two years later, clear differences were seen in favour of the intervention group, suggesting that the intervention may have had the intended effect. It goes without saying that it is still too early to draw any far-reaching conclusions about the future smoking habits of young people (10–12), but the postponement of starting smoking is of course valuable for health (7).

The strength of the study lies in the large, population-based cohort of pupils and the negligible dropout. The latter was mainly due to the absence of some pupils from school when the questionnaires were completed (3, 4). Only a few questionnaires had to be excluded because they were incorrectly completed (3, 4). Since they were completed anonymously, it is likely that any under-reporting of the percentage of smokers was avoided.

If the statistical analysis is based on the roughly 2000 individuals, the difference between the intervention group and the control group was statistically significant (Table 3), but with a more conservative analysis, using the 80 schools as units of analysis, we obtained a non-significant result. The latter analysis is perhaps more correct, since it was not the pupils but the schools that were able to choose whether or not to have the intervention. However, in the recently published Norwegian intervention study (12), the analysis was based on the individual pupils.

The schools were thus not randomized to the intervention group and the control group; they were free to choose whether they wanted to be visited by A Non-Smoking Generation. There may thus of course have been differences between the two groups from the beginning, as regards the attitude of the schools to tobacco-prevention work. Proportionately more big schools accepted visits from A Non-Smoking Genera-

tion, while the majority of the schools in the two groups were situated in the countryside.

Perhaps it is not very credible that the brief intervention in the sixth grade alone has contributed to the difference in the frequency of smoking shown in the eighth grade (10–16); it is probable that there has also been more work on tobacco prevention in the intervention schools than in the control schools. Nor do we know whether the smoking habits of parents differ between the two groups of schools, although there is nothing to suggest that this is the case.

Regardless of the reasons, it is interesting that such clear differences in the frequency of smoking can arise in just a few years in schools which initially had the same frequency of smoking pupils. A non-smoking policy in school seems to reduce consumption among smokers and hence delays the development from experimental smoking to compulsive smoking (18, 19).

No study of the work of A Non-Smoking Generation has hitherto been conducted in Sweden, but large-scale smoking-prevention efforts to influence behaviour in other Nordic countries have had favourable effects on the development of smoking among schoolchildren (10–12), whereas a randomized British study failed to demonstrate any effect of a large-scale intervention (17).

References

1. WHO. The health of youth. A cross-national survey. Copenhagen: WHO Publications, European Series; 1996
2. Andersson B, Hibell B. Skolelevers drogvanor 1999. Stockholm: Centralförbundet för alkohol och narkotikaupplysning; 1999. In Swedish
3. Berg-Kelly K. Normative developmental behavior with implications for health and health promotion among adolescents: a Swedish cross-sectional survey. Acta Pædiatr 1995; 84: 278–88
4. Grufman M, Carlsten C, Krabbe M, Berg-Kelly K. Health and health behaviours among Swedish adolescents during a period of social change. Acta Pædiatr 1999; 88: 1380–4
5. Nordgren P. Hur många ungdomar börjar röka varje år? Stockholm: Folkhälsoinstitutet; 1996: In Swedish
6. Folkhälsoinstitutet. Aktuellt om tobak. Åldersgräns vid tobaksförsäljning? Stockholm: Folkhälsoinstitutet; 1995: In Swedish
7. McKennel A, Thomas R. Adults' and adolescents' smoking habits and attitudes. London: HMSO; 1967
8. Preventing tobacco use among young people. A report of the Surgeon General. Atlanta GA: US Department of Health and Human Services, Public Health Service, Center for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office of Smoking and Health; 1994
9. Galanti MR, Jacobsson M, Lambe M. Skolbaserad prevention en framkomlig väg? Läkartidningen 1998; 95: 1298–300. In Swedish
10. Vartiainen E, Fallonen U, McAlister AL, Puska P. Eight-year follow-up results of an adolescent smoking prevention program: the North Karelia Project. Am J Public Health 1990; 80: 78–9
11. Vartiainen E, Paavola M, McAlister A, Puska P. Fifteen-year follow-up of smoking prevention effects in the North Karelia youth project. Am J Public Health 1998; 88: 81–5
12. Svoen N, Schei E. Adolescent smoking prevention—primary health care in cooperation with local schools. A controlled intervention study. Scand J Prim Health Care 1999; 17: 54–8
13. Center for disease control and prevention. Guidelines for school health programs to prevent tobacco use and addiction. J School Health 1994; 64: 353–9
14. Perry CL, Kelder SH, Murray DM, Klepp KI. Communitywide smoking prevention: longterm outcomes of the Minnesota Heart Health Program and the Class of 1989 Study. Am J Public Health 1992; 82: 1210–6
15. Nutbeam D, Macaskill P, Smith C, Simpson JM, Catford J. Evaluation of two school smoking education programmes under normal classroom conditions. Br Med J 1993; 306: 102–7
16. Flynn BS, Worden JK, Secker-Walker RH, Pirie PL, Badger GJ, Carpenter JH. Long-term responses of higher and lower risk youth to smoking prevention interventions. Prev Med 1997; 26: 386–94
17. Aveyard P, Cheng KK, Almond J, et al. Cluster randomised controlled trial of expert system based on the transtheoretical ("stages of change") model for smoking prevention and cessation in schools. Br Med J 1999; 319: 948–53
18. Pentz MA, Brannon BR, Charlin LV, Barlett EJ, MacKinnon DP, Flay BR. The power of policy: the relationship of smoking policy to adolescent smoking. Am J Public Health 1989; 79: 857–62
19. Clarke V, White V, Hill D, Borland R. School structural and policy variables associated with student smoking. Tobacco Control 1994; 3: 339–46

Received Nov. 25, 1999; revision received March 31, 2000; accepted June 14, 2000

Paper II

Scandinavian Journal of Primary Health Care, 2009; 27: 41–46

informa
healthcare

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

INGRID EDVARDSSON[1], LENA LENDAHLS[2] & ANDERS HÅKANSSON[1]

[1]*Department of Clinical Sciences, Malmö – General Practice/Family Medicine Lund University, Malmö University Hospital, Malmö,* [2]*Unit for Research and Development, Kronoberg County Council, Växjö, Sweden*

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

Correspondence: Ingrid Edvardsson, Unit for Research and Development, Kronoberg County Council, Box 1223, SE-351 12 Växjö, Sweden. E-mail: ingrid.edvardsson@ltkronoberg.se

(Received 11 January 2008; accepted 21 October 2008)

ISSN 0281-3432 print/ISSN 1502-7724 online
DOI: 10.1080/02813430802588675

Tobacco use is normally established in the teenage years, and the years between 10 and 13 seem to be a particularly sensitive period to initiate a smoking debut.

- 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).
- Studying young people's tobacco habits over time gives an understanding of when preventive measures should be implemented.

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.

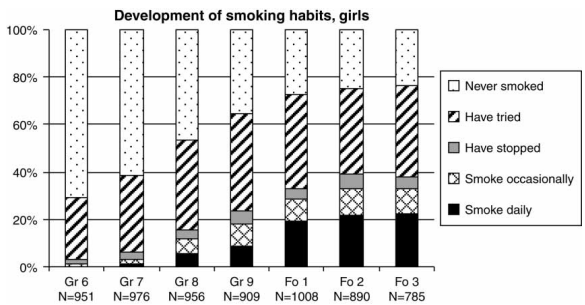

Figure 1. Development of smoking habits for girls, from grade 6 to form 3 of upper secondary school.
Note: The internal dropout varied between two and four during the seven years.

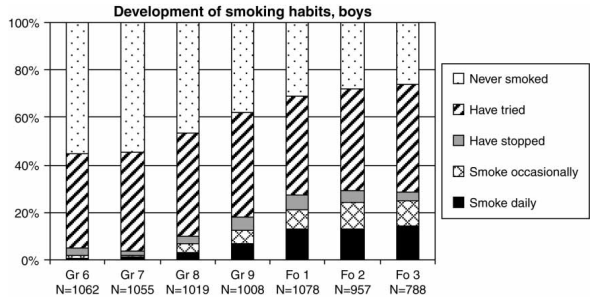

Figure 2. Development of smoking habits for boys, from grade 6 to form 3 of upper secondary school.
Note: The internal dropout varied between two and 12 during the seven years.

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,

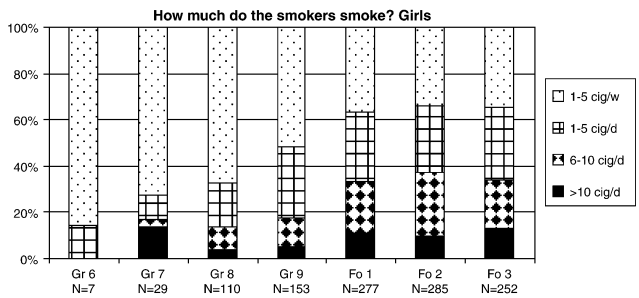

Figure 3. Development of cigarette consumption for the smoking girls, from grade 6 to form 3 of upper secondary school.
Note: The internal dropout varied between two and 12 during the seven years.

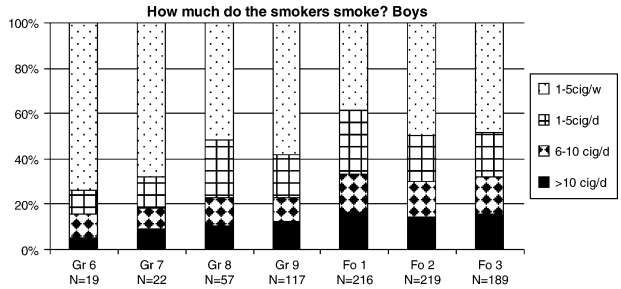

Figure 4. Development of cigarette consumption for the smoking boys, from grade 6 to form 3 of upper secondary school. Note: The internal dropout varied between two and 15 during the seven years

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.

References

[1] Stanton WR, Silvia PA, Oei TPS. Change in children's smoking from age 9 to age 15 years: The Dunedin Study. Public Health 1991;105:425–33.

[2] Järvelaid M. Adolescent tobacco smoking and associated psychosocial risk factors. Scand J Prim Health Care 2004;22: 50–3.

[3] Kandel DB, Logan JA. Patterns of drug use from adolescence to young adulthood: Periods of risk for initiation, continued use and discontinuation. Am J Public Health 1984;74:660–6.

[4] Taioli E, Wynder EL. Effect of the age at which smoking begins on frequency of smoking in adulthood. N Engl J Med 1991;325:968–9.

[5] Preventing tobacco use among young people: A report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention, Office of Smoking and Health, 1994.

[6] DiFranza JR, Savageau JA, Fletcher K, Ockene JK, Rigotti NA, McNeill AD, et al. Measuring the loss of autonomy over nicotine use in adolescents: The DANDY Study. Arch Pediatr Adolesc Med 2002;156:397–403.

[7] DiFranza JR, Savageau JA, Fletcher K, O'Loughlin J, Pbert L, Ockene JK, et al. Symptoms of tobacco dependence after brief intermittent use. Arch Pediatr Adolesc Med 2007;161: 704–10.

[8] Health and health behaviour among young people. WHO policy for children and adolescents, 2000. Copenhagen: WHO Regional Office for Europe; 2000.

[9] Hvitfeldt T, Rask L. Alcohol and drug habits of school children 2005 (in Swedish). Stockholm: Centralförbundet för alkohol och narkotikaupplysning (CAN); 2005.

[10] Andersson B, Hibell B. Alcohol and drug habits of school children 1996 (in Swedish). Stockholm: Centralförbundet for alkohol och narkotikaupplysning (CAN); 1996.

[11] McNeill AD, Jarvis MJ, Stapelton JA, Russell MA, Eiser JR, Gammage P. Prospective study of factors predicting uptake of smoking in adolescents. J Epidemiol Community Health 1989;43:72–8.

[12] Stanton WR, McClelland M, Elwood C, Ferry D, Silvia PA. Prevalence, reliability and bias of adolescents' reports of smoking and quitting. Addict 1996;91:1705–14.

[13] Health related lifestyle habits – what we know and what we need to know? (in Swedish). Stockholm: Statens Folkhälsoinstitut; 2003.

[14] Galanti RM, Rosendahls I, Post A, Gilljam H. Early gender differences in adolescent tobacco use: The experience of a Swedish cohort. Scand J Public Health 2001;29:314–7.

[15] Von Bothmer M, Mattsson B, Fridlund B. Influences on adolescent smoking behaviour: Siblings smoking and norms in the social environment do matter. Health Soc Care Community 2002;10:213–20.

[16] Mayhew KP, Flay BR, Mott JA. Stages in the development of adolescent smoking. Drug Alcohol Depend 2000;59: 61–81.

[17] Bricker JB, Leroux BG, Peterson AV, Kealey KA, Sarason IG, Andersen MR, et al. Nine-year prospective relationship between parental smoking cessation and children's daily smoking. Addict 2003;98:585–93.

[18] McGee R, Williams S, Reeder A. Parental tobacco smoking behaviour and their children's smoking and cessation adulthood. Addict 2006;101:1193–201.

[19] Jackson C, Dickinson D. Enabling parents who smoke to prevent their children from initiating smoking. Arch Pediatr Adolesc Med 2006;160:56–62.

[20] Nilsson M. Adolescents about tobacco: Habits, knowledge, and attitudes (in Swedish). Stockholm: Statens Folkhälsoinstitut; 2005.

[21] Christianson M, Lalos A, Johansson EE. Concepts of risk among young Swedes tested negative for HIV in primary care: Focus-group interviews. Scand J Prim Health Care 2007;25:38–43.

[22] Brekke M, Rekdal M, Straand J. Which population groups should be targeted for cardiovascular prevention? A modelling study based on the Norwegian Hordaland Health Study (HUSK). Scand J Prim Health Care 2007;25:105–11.

[23] Sandbaeck A. Children and adolescents presenting in general practice: Potential for identification and intervention against overweight. Scand J Prim Health Care 2007;25: 193–4.

[24] Jallinoja P, Absetz P, Kuronen R, Nissinen A, Talja M, Uutela A, Patja K. The dilemma of patient responsibility for lifestyle change: Perceptions among primary care physicians and nurses. Scand J Prim Health Care 2007;25:244–9.

[25] Sondergaard G, Biering-Sorensen S, Ishoy Michelsen S, Schnor O, Nybo Andersen AM. Non-participation in preventive child health examinations at the general practitioner in Denmark: A register-based study. Scand J Prim Health Care 2008;26:5–11.

[26] Färnkvist L, Olofsson N, Weinehall L. Did a health dialogue matter? Self-reported cardiovascular disease and diabetes 11 years after health screening. Scand J Prim Health Care 2008; 26:135–9.

Paper III

Submitted

Snus user identity and addiction. A Swedish focus group study on adolescents

Ingrid Edvardsson[1], Margareta Troein[1], Göran Ejlertsson[2], Lena Lendahls[3]

[1]Department of Clinical Sciences Malmö, Lund University, Sweden [2]School of Health and Society, Kristianstads University, Sweden [3]Unit for Research and Development, Kronoberg County Council, Sweden

Abstract

Background

The teenage years are the years when they seek their identity, and when they experiment with tobacco. The use of tobacco as such, and norms among their friends, are more important to the individual than the norms of parents regarding whether he/she will start using tobacco or not. The aim was to explore the significance of using snus for adolescents, and attitudes to snus, as well as the reasons why they began using snus and what maintained and facilitated the use of snus.

Methods

Adolescents who use snus were interviewed in focus groups. The material was analysed using content analysis.

Results

Four groups of boys and one group of girls were interviewed, a total of 27 students from the upper secondary vocational program. Three themes related to the students' opinions on and experiences of using snus were found: *Circumstances pertaining to snus debut* indicate what makes them start using snus. *Upholding,* which focuses on the problem of becoming addicted and development of identity, and a*pproach*, where the adolescents reflect on their snus habits in relation to those around them. A number of factors were described as relevant to behaviour and norm building for the development into becoming a snus user. Attitudes and actions from adults and friends as well as – for the boys – development of an identity as a man and a craftsman influenced behaviour.

Conclusions

The results showed that development of identity was of major importance when adolescents start using snus. The adolescents were initially unable to interpret the early symptoms of abstinence problems, but subsequently became well aware of being addicted. Once they were stuck in addiction and in the creation of an image and identity, it was difficult to stop using snus. These factors are important when considering interventions of normative changes and tobacco prevention in schools as well as among parents.

Key words: Adolescents, addiction, content analysis, focus group, snus user, identity

Background

Adolescence has been identified as the period in life when experimentation with tobacco increases dramatically. Swedish studies indicated that the use of snus is introduced later than smoking among adolescents [1, 2]. In grade 2 in upper secondary school (age 17), 24 per cent of the boys and seven per cent of the girls used snus in Sweden 2011, and the trend is slowly decreasing [3].

Smokeless tobacco use occurs in a number of countries around the world, and smokeless tobacco comes in a variety of ways. The products contain unhealthy substances at different levels, and nicotine, that get the user hooked on the addiction [4]. Snus (the traditional Swedish type of oral moist snuff) is forbidden for export outside Sweden. The use of snus increases the risk of reversible and irreversible oral lesions, ventricle, and oesophagus [5-8], and it also increases the risk of dying from a heart attack or stroke [9, 10]. Using snus during pregnancy increases the risk of premature delivery and pre-eclampsia [11].

Social identity and belonging to a group are important during the adolescent years, a time when it is common among teenagers to experiment with tobacco. This could be part of the adolescent seeking his/her identity. Friends have an important role in a young person's life, and the group norms, attitudes and behaviour of the friends have a stronger impact on the adolescent than those of his/her parents [12]. According to Tajfel's theory, a social identity is created in three steps. The first is categorization, the grouping of yourself in a hierarchy based on how you feel other people see you, secondly identification when you are compared with others, and - finally - by social comparison when you identify yourself with other people in the same group, such as those who have the same profession or nationality, and where you perceive your own group in a more positive way than other groups [13].

Why adolescents start using tobacco is determined by multiple factors. According to Ajzen's Theory of Planned Behaviour (TPB), the individual behaviour depends on different factors that contribute to actions as behaviour, and normative beliefs, and attitudes towards the behaviour. TPB contends that a strong link between intentions and behaviour [14]. More recent research on smoking has used TPB as a rule of thumb for understanding the motivation behind whether you start smoking or not. TPB demonstrated that the intentions to smoke were normally directed by attitudes and perceived behavior control [15]. Another factor that complicates the picture of the onset of snus use is the development of nicotine addiction. Studies indicate that occasional smoking during adolescence can cause a rapid development of nicotine addiction, even before smoking becomes a daily habit [16]. A Swedish study showed that adolescents who are exclusively using snus had a two to fivefold higher risk of becoming addicted to nicotine compared to those exclusively smokers [17].

As far as we know, there are no previous studies on adolescents' experiences of snus usage. The aim was to explore the significance of using snus for adolescents, and attitudes to snus, as well as the reasons why they began using snus and what maintained and facilitated the use of snus.

Method

Study population

The study was performed in the county of Kronoberg in southern Sweden, with 185 000 inhabitants in eight municipalities. There are 19 upper secondary schools in the county, both private and municipal ones. A majority of the students (66 percent) went to schools in the largest municipality with around 83 000 inhabitants.

Study design

Focus group interviews are defined as a scientific method where data is collected through group interaction on a topic decided by the scientist [18]. This method was selected for studying the contents, i.e. the views, attitudes, opinions, and arguments the participants expressed in a group. Focus group interviews will also give insight into the ideas and concepts used in a cultural context [19]. The method gives a variety of opinions as well as close contact with the snus-using adolescents for increased knowledge without the purpose of reaching consensus or influencing them in any direction.

The participants were recruited through the school nurse who had a relatively good knowledge of the students' tobacco habits, as she had regular individual health discussions with them on general life habits. The school nurse received oral information by phone from IE and instructions in writing on the selection. Inclusion criteria were that the participants used snus on a regular basis but did not smoke. They should not have a chronic illness such as asthma or diabetes, as health reasons may have influenced their choice to use snus instead of smoking. Adolescents using snus were invited into the study and received information in writing on the purpose of the group interview, on the procedure, and that all the material would be treated as strictly confidential. The adolescents gave written, informed consent to their participation. In total, 27 adolescents participated, aged 17-19, divided into five groups with four to six students in each group. Four groups of boys, and one group of girls from three schools were included in the study. The groups were based on the respective schools and the participants knew each other to some extent. They were all recruited from vocational upper secondary programs, such as building, farming, vehicle and animal care. As seen in a local questionnaire study, most snus users attended vocational programs [20].

The first author (IE) acted as moderator of the focus group discussions during the interviews. The role of the moderator was to be prepared to guide the discussions if the group deviated from the subject, ask clarifying questions when necessary, and ensure that all the participants got a chance to voice their views. An assessor (LL) listened, observed, and took notes. Both were unknown to the participants. A guide with questions was developed with five different

topics of interest: how they started using snus, circumstances that enabled the onset, students' views on prevention, attitudes to snus use and speculations about the future. Each topic had open questions and they were constructed based on earlier questionnaires used in upper secondary school [20]. The interviews were conducted during school hours in a room at the students' schools and lasted about 40-60 minutes each.

Analysis

Qualitative content analysis was carried out with an inductive approach according to the Graneheim and Lundman theory [21]. This meant that meaningful units were identified, condensed and coded into categories. These categories were grouped according to content to form themes. This method was selected in order to create a clear and manageable picture of the participants' experiences of being a snus user. The interviews were recorded on tape and transcribed verbatim by a secretary. IE listened to the recorded interviews and took notes to describe the feelings and the atmosphere of the interview situations. The material was read through a number of times to catch the overall feeling by IE and LL. To be true to the context, the meaningful sentences were condensed to a description close to the text, the manifested content, as well as an interpretation of the underlying meaning, the latent content. To enable processing of the text, the analysis was done in different steps. Firstly, meaningful units from all interviews were identified, and these were then condensed and coded and finally put together into different categories. IE and LL conducted the interviews and analysed the text, independent of each other, and then the different steps of the analysis were discussed until consensus was reached. An example of the analysis process is shown in Table 1. To clarify the results, three themes were crystallized to a more abstract level on the basis of the categories. Representative quotations are presented in italics and the group origin is presented in brackets. Group 1-4 consisted of boys and group 5 of girls only.

Table 1. Example of the analysis process.

Meaningful unit	Condensation	Code	Category
We use snus in the vehicle program. Truck drivers, vehicle mechanics, and construction workers	The trade you belong to is associated with snus use.	Snus is used in certain professions	Identity

Ethics

Before the students were approached, the principals of the schools sanctioned the study at their schools. The participating adolescents were informed in advance, and at the time of interview, about confidentiality and that participation in the study was voluntary. Before the interviews started, the participants gave their written informed consent for participation. If any of the respondents needed support after the interview to give up their tobacco use, the school nurses would assist them**.**

The study was conducted in agreement with Swedish Laws on Research Ethics and was approved by the Regional Ethics Committee at Linköping University (approval number 175-09).

Results

The analysis of the text content resulted in eight categories. Three themes were developed from these (Table 2). These themes took up areas about the circumstances influencing the adolescents when they started using snus and the factors making them continue to use snus, and what the snus means to them, their approach to their roles as snus users in relation to others and how they saw themselves in the future. As differences in opinions and views between boys and girls have been noted, they have been reported in separate groups. The related categories are indicated in **bold text** and illustrated by quotes for each theme to show the foundation for our interpretation of the focus group discussion data.

Table 2. The eight categories and three themes in the analysis.

Categories	Theme
Influence from significant others	Circumstances
Availability	pertaining to
Parent reactions	snus debut
Caught in addiction	Upholding
Identity	
Perceived advantages	
Influence others	Approach
Ambivalence	

Circumstances pertaining to snus debut

The most important circumstance pertaining to snus debut was the **influence from significant others**. All participants had been influenced to start using snus by friends who treated them to snus. It was rarely a conscious choice but something that ”just happened”. The analysis showed that regardless of whether they were aware of it or not, there was a group of snus-using friends in the background who influenced them. Many adolescents stressed the importance of being part of the group, which resulted in trying snus, and the difficulty to withstand peer pressure. Being part of the snus user group gave a feeling of belonging and identity. Snus-using family members were also role models, and together with these, they got a feeling of belonging when they used snus.

”I was with friends who were using snus, and then they gave me some and I bought a box myself and then I had started”.
Interview 1

Many of the adolescents described how they had practised in different ways in order to be able to use snus. By gradually getting used to the snus, they had “practiced away” physical

symptoms such as nausea and dizziness. Overcoming initial feelings of disgust when they had gotten used to it gave room for other strong feelings of it being super and cool. They used snus to impress, be tough and cool, to defy something that was "forbidden" and because they appeared more grown-up. When they had tried it a few times, they continued without reflecting on the fact that it had become a habit.

"Then you felt so bloody sick, but still, the next time you still wanted it and then you felt just as sick again... but then it's like you get going on it"
Interview 1

The **availability** of snus enabled them to become snus users. The adolescents never felt it was difficult to get access to snus and described how family members, such as the father and brothers, would offer them snus. After telling their parents they were using snus, some parents even bought them snus if they were under 18. But most common was that friends bought it for them, as they did not want to get their parents involved. Sometimes, they could even buy snus themselves, as there were always sales points where IDs were not checked. It quickly spread among friends where these sales points could be found.

"You talk to those who are over 18 and then it's not a problem; it's fixed. That's why you have older friends who can buy it."
Interview 4

"He did not check my ID and he did know I was younger... so he told me to put it in my pocket before I went away."
Interview 3

The **parents' reactions** were feeble, and not as strong as what the adolescents had expected. As they thought the reactions would be stronger, it took time before they had the courage to tell the parents that they were using snus, and they hid the snus boxes and tried in various ways to conceal their snus use. Few parents reacted strongly, others were resigned, and the adolescents thought they did not bother. Their failure to react made it easier for the students to become snus users. Some had parents who encouraged them to use snus instead of smoking, as snus was seen as a more healthy alternative. Some of the girls had not told anyone that they had started using snus instead of smoking, as the parents had previously reacted very strongly to their smoking and they wanted to avoid a new discussion about their snus habits. At the same time, some felt that the parents would not be able to do anything about them using snus anyway. It was their own choice.

"I felt more motivated to quit before my parents found out, because I thought there would be a hell of an uproar at home, but when I noticed that they did not care, it felt like… to hell, it doesn't matter."
Interview 2

Upholding

Fairly quickly, the students, especially the boys, felt that they had been **caught in addiction** to nicotine. The physical addiction appeared as abstinence problems and they experienced various symptoms, which were not easily understood as they did not know what abstinence meant. Some wished they had quit before they got stuck with an addiction, some had experienced that it was difficult to quit, while others thought they could quit whenever they liked. The habit of always having something under the lip made them put in snus even if they did not feel a craving. The adolescents also expressed a social addiction, feeling that they felt they belonged to a group and the feeling of belonging from using snus together. The fellowship feeling could also make it harder to stop using snus, and most of the respondents felt that a snus-free environment was a prerequisite for being able to quit. It was hard to resist classmates using snus, and thus also difficult to stop using snus as long as you went to school.

"There is nothing positive about using snus, you know. Really! You learn to like it as times goes on, sort of, and then you feel that you need another one. No… there is nothing positive whatsoever, really, but it's the thing you kind of do and then it get you addicted to it."
Interview 3

"That's nearly all it's about when you're young, and it should be as cool as possible and when you think it's super-cool and then as you get older you realize you're stuck on it, so it's not so cool anymore."
Interview 3

The girls expressed a mental addiction where snus was a good way to reduce their bad temper or irritation. If they were sad or angry, they used more snus, but when they were happy they did not need as much. Both boys and girls reported that they used less snus if they were busy with something, such as fixing a car or tending to a horse. On the other hand, they used more snus if they were bored and had nothing to do.

"Yes... but I don't use snus that much, I don't take a lot of it, but when I feel that I am getting into a bad temper, I take some snus and then I can manage for another good while, and sometimes I don't need any snus because I feel happy."
Interview 5

To be using snus is considered an **identity**, something one should be for the rest of the life. Most of the boys saw themselves as snus users in the future, but they could still consider quitting if they were going to be parents. To use snus was considered something genuinely Swedish, something in our culture, and the general opinion was that no immigrants used snus. The boys felt they were very masculine, and there were also those who claimed that their girlfriends thought it was sexy with snus and that it suited them to be snus users. The snus box was seen as a masculine attribute, which created a feeling of belonging. Using snus was also something associated with the professions they had chosen, for example farmers, carpenters, and car mechanics. In general, the boys reacted to the fact that the girls were using snus, as

they felt it was a manly behaviour. Furthermore, it did not appear very attractive. Smoking was considered silly and something girls did to be cool. The adolescents felt there was a clear difference between using snus and smoking, but they found it hard to express what was different. Snus users were seen as better by both sexes, while smokers were less valued and sometimes despised. The girls said there was a clear difference where ”tomboys” used snus and ”bimbos” were smokers. The girls who used snus wanted to stick out from the crowd and be a bit different.

”Well, it’s just... ah... it is manly!”
Interview 2

Well, it’s just like that, that farmers should use snus.”
Interview 4

”Well, bimbo… these little girls... mammies’ girls, you see them... they smoke... they would probably not ever consider using snus, but I guess they are more into smoking...”
Interview 5

The adolescents felt using snus had a number of **perceived advantages**. In school, there are lots of rules around smoking, but not around using snus. Using snus undisturbed was possible during class, without bothering anyone, but as a smoker you were referred to a certain place, and having to smoke outside in rain and cold weather was not an attractive alternative. They also saw the advantage that you did not smell, which the smokers did. Using snus was not considered a risk – health risks were regarded as uncommon and not well known. When they had used snus for a while and become used to it, they experienced a number of positive effects, such as that it was tasty and relaxing, and it gave a feeling of performing better and being able to concentrate.

”It gives an extra energy kick.”
Interview 4

”In school, you are not allowed to smoke– but it is okay to use snus, and you just throw it in the bin.”
Interview 4

”People around you are not harmed. Snus doesn’t smell and you don’t see it under the lip.”
Interview 3

Approach

Even though the adolescents themselves had been **influenced by others** to start using snus, they did not feel that they influenced younger people to start. When the boys were occasional snus users, they were treated to it by snus using friends and never had to ask for it. As more established snus users, they never offered someone else snus, but treated their friends when

they asked. Even if the adolescents felt grown-up when they started using snus, they did not want to give snus to younger children (around 12) as they did not want to contribute to their addiction. They were supposed to be older, around 15, and snus users already to be treated to it. The adolescents thought that it was up to the younger children to make their own choice about using snus. Friends who smoked were encouraged to switch over to snus as it had more advantages. One opinion they wanted to convey to younger children was that if they were to do something, they should use snus as it was considered less harmful. At the same time, they wanted to dissuade them from starting, and most of them felt it was stupid to start something that made you addicted and cost money. This was something they had not fully comprehended when they started.

"We normally treat those who ask... it's only because you want to be kind, and they will have to face the consequences if they want it, as it's not our problem."
Interview 1

"If someone who is 12 or so comes, I don't give them snus. They should at least be in ninth grade and be snus users... I don't think I would give them something that would make them addicted."
Interview 3

Girls reported that it seldom occurred that someone asked them for snus, so they rarely had to treat others to it, and they did not feel they influenced others to start.

The views of the adolescents were **ambivalent** about whether they should continue with snus or not in the future. They felt it must be their own decision to quit, and nobody else could influence them. But a strong reaction or demand from family or girlfriend could lead to an attempt to quit. Another reason could be to improve their economy. Health reasons were not strong arguments, and as they did not experience many disadvantages from using snus, most of them were not very motivated to quit. The girls were more divided regarding future use of snus, and it was more difficult for them decide whether they would quit in case they got pregnant.

"I think I will actually continue using snus for the rest of my life."
Interview 1

"The idea is that I will be free from nicotine later… by the summer holidays."
Interview 5

Discussion

The study shows that the process of becoming a snus user contains several steps. As a beginner, you have to endure a number of physical symptoms such as nausea, dizziness and vomiting, which resolve after training some time. Certain circumstances are required for becoming a snus user – friends who use snus, access to snus, and that using snus becomes an important part to the person's identity. Snus is most often used in a social context that

promotes participation and belonging to a group. The picture becomes more complicated by an addiction that develops gradually.

This study shows that being a snus user functions as a social identity and can be seen as an expression of belonging to a group and be like one's friends. Studies have also shown that adolescents start smoking, and continue smoking, to develop a desired social identity among important groups of friends [22]. The peer group is important for socialisation of the adolescent, while they try to find out what works in different social contexts and for themselves. They adapt their behaviour to that of others in the same category, which is an oblivious process. Many adolescents believe that it is more important to imitate peers than adults [23]. According to Tajfel's theory on social identity, people identify with those they feel are most like themselves, and join the group that positively affects their social identity [24]. An individual selects his/her social identity based on what is in agreement with his/her expectations and subjective norms. This is also confirmed by our results that the adolescents reported that using snus is part of the picture regarding their choice of profession. Friends give support to and nourish their new identity as a future grown-up [25]. The adolescents in the study also reported that "all" the friends were using snus around them, and that it was their own choice and that their parents had no say in this.

The adolescents were at an age when their identities were developed and they had selected professions that were traditionally male, and the boys felt that using snus was something very manly and closely connected to the future professional role, such as being a farmer or a car mechanic. In Sweden, using snus is considered traditional manly behaviour, which is not the case for smoking, and this is confirmed by studies on tobacco habits [1, 3]. The study found that it was important to the boys to identify and position themselves as "a real man", which in part was demonstrated by the use of snus. According to Connell's theory on the hierarchy of masculinity, there is an overall culturally and collectively preserved male norm based on a historical ideal on what a "real man" should like and how he should behave [26]. The boys said that girls who used snus were not appealing. This could possibly be interpreted as a male desire to keep the snus as a symbol of masculinity, and that girls should not be associated with "their" symbol. Boys thought that girls who used snus were unwomanly, and it was more accepted if they smoked, which stresses the stereotype cultural image about was is manly and womanly [27].

With their use of snus, the girls wanted to convey that they were independent and had an identity of their own. It made them different and special, and they described themselves as "tomboys". The girls expressed their desire to revolt against the norm that it is manly to use snus. This may be a sign of liberation, a diversion from the expected picture of how girls should be. There are rules for how a man and a woman should be, but the social construction is created and re-created depending on the culture we live in [28].

The results demonstrated that the perceived expectations by the adolescents of important people around them made them try snus and eventually learn to like it. To start smoking was not viewed as an alternative. Snus was the first choice as the attitudes from their surrounding

were seen as positive. These circumstances are in agreement with Ajzen's Theory of Planned Behaviour (TPB) [14]. The positive attitude towards using snus as well as the experience of subjective norms, were the strongest factors that made it easier for them to start using snus. The adolescents' experience that everybody around them was using snus strengthens the theory that attitudes and norms lead to intentions and behaviour. The adolescents had also considered the consequences of their action, and this influenced their attitudes to the behaviour [14].

The adolescents in the study described how they gradually got stuck in an addiction and were unaware of the fact that the abstinence symptoms they felt could be nicotine addiction. Many of those interviewed had their own experiences of addiction and abstinence symptoms, which they found difficult to endure. A study has shown that early symptoms of addiction are important to the development of tobacco use, and that adolescents find it hard to understand what abstinence symptoms are and what they mean [29]. Adolescents addicted to nicotine do not need to be daily users of tobacco. Just feeling a strong craving for nicotine is reason enough to smoke a cigarette. The first symptom of addiction starts with a strong desire to smoke, followed by nicotine abstinence, which leads to smoking more and more often until you eventually become a daily smoker with an addiction and problems to control the smoking [29]. There is also a strong connection between early symptoms of nicotine addiction and lifelong smoking [30]. It can be assumed that the process is similar for snus users, but studies on this are lacking. A Swedish study of adolescents showed that snus-using adolescents had a four times higher risk of nicotine addiction compared to smoking adolescents [17].

The parents did not react as strongly as the adolescents had expected, and if they had made it clearer that it was not acceptable to use snus, this would probably have made more of them quit using snus. Similar results were seen in a Swedish study on smoking adolescents who wanted the parents to have explicit non-smoking norms, and that compliance was based on good mutual relationships [31].

In this study, both boys and girls reported using snus less if they were distracted by an activity. Furthermore, the girls said they used snus to control their feelings, to reduce their bad temper or if they were sad or angry. A Swedish study on smoking adolescents highlighted the positive effects of nicotine, that it both ”increased the well-being” and could ”handle negative emotions” [31]. Girls also reported that smoking was a way to handle stress and negative feelings.

Limitations of the study

A weakness in the results is that the adolescents only represented the practical upper secondary program, and that there were few girls. However, in academic programs, and among girls, only a minor part of nicotine users prefer snus, making it difficult to recruit informants. The findings are not intended to be generally applied, but rather to give in-depth information on the attitudes and opinions of a group of adolescents. It is up to the reader to decide the extent to which the results can be applied to other groups or circumstances.

The results showed that the interviewed adolescents identified themselves as snus users in their future professional roles. For an added dimension in the results, it would have been interesting to include adolescents from the academic program in the study. On the other hand, the results become more specific with adolescents only from the vocational program.

Methods discussion

Focus group interview is a qualitative research method, which is used for collection of data on attitudes, experiences and opinions of groups [32]. Through the interviews, knowledge was acquired from discussions between adolescents, who were given the opportunity to describe and discuss their snus use habits in their own words. The method gave insight into what it is like to be a snus user and how it started. Since focus group interviews rely on discussions among participants, group members may influence each other as to how they respond to ideas and comments that arise during the discussion [19]. However, it is important to bear in mind that data acquired from a focus group are group data, which reflect the collective ideas shared and talked about by the group. In a focus group, the participants are in a more natural environment than during individual interviews. They are together with their friends and can both influence and be influenced by each other, which is what happens in real life [19].

The interviews were semi-structured and the discussion was based on open questions made up in advance. Thus, the person conducting the interviews may have influenced how the respondents express their experiences. The questions were not asked in a certain order or literally, which gave room for spontaneity, but still with some structure. To make the group discussion easier, boys and girls were interviewed in separate groups, which is recommended in studies with expected differences between the sexes [19].

The purpose of qualitative content analysis is to acquire both knowledge of and an understanding of the phenomenon studied [21]. As we set out to identify variations with regard to differences and similarities of a text, content analysis with an inductive approach was selected. Graneheim and Lundman highlight the importance of the communication for the interpretation as one of the characteristics of content analysis [21]. Texts based on interviews are formulated through interaction between the respondent and the person conducting the interview. The analysis is an unprejudiced description of the variations by identifying differences and similarities in the text, and they are expressed in categories and themes where context is very essential.

The analysis highlighted characteristic and representative elements in order to increase the dependability of the results. To ensure as high credibility as possible, two of the authors (IE, LL) made the analysis independent of each other.

Conclusion

This study has several implications for preventive and promotional work. The results showed that development of identity was of major importance when adolescents start using snus. The adolescents were unable to interpret the early symptoms of abstinence problems but

subsequently were well aware of being addicted. Once they were stuck in a developed addiction and the creation of an image and identity, it was difficult to stop using snus. These factors are important when considering interventions of normative changes and tobacco prevention in schools as well as among parents. It is important to see snus as an addictive product whose health effects are not researched enough at present. We think that using snus should not be seen as a more healthy alternative to smoking, and parents should be involved in the message of a tobacco-free adolescence. A Totally tobacco-free school time, i.e. that nobody smokes or uses snus in school, contribute to a change of norms and attitudes towards a tobacco-free life, and it furthers a more healthy adolescence.

Competing Interests

IE works with tobacco prevention in the Kronoberg County Council. The authors declare that they have no competing interests relating to this study.

Authors contributions

IE was the main author of the manuscript and involved in all aspects of the study. LL participated in the interviews and analyses. MT, GE, and LL were co-authors and provided scientific oversight and feedback throughout the development of the study and this article. All authors read and approved the final version of the article.

Acknowledgement

Research funding support for this article was received from County Council of Kronoberg, Region Skåne, Sweden and The Swedish National Institute of Public Health. There are no conflicts of interest to declare. Many thanks to the adolescents who shared their experiences of using snus with us. We also wish to thank Dorthe Geisler who transcribed the recorded interviews.

References

1. Edvardsson I, Lendahls L, Hakansson A: **When do adolescents become smokers? Annual seven-year population-based follow-up of tobacco habits among 2000 Swedish pupils--an open cohort study**. *Scand J Prim Health Care* 2009, **27**(1):41-46.
2. Galanti MR, Rosendahl I, Wickholm S: **The development of tobacco use in adolescence among "snus starters" and "cigarette starters": an analysis of the Swedish "BROMS" cohort**. *Nicotine Tob Res* 2008, **10**(2):315-323.
3. Henriksson C, Leifman H: **Skolelevers drogvanor**. Stockholm: Centralförbundet för alkohol- och narkotikaupplysning; 2011.
4. Hecht SS: **Tobacco carcinogens, their biomarkers and tobacco-induced cancer**. *Nat Rev Cancer* 2003, **3**(10):733-744.
5. **Smokeless tobacco and some tobacco-specific N-nitrosamines**. *IARC Monogr Eval Carcinog Risks Hum* 2007, **89**:1-592.
6. Salonen L, Axell T, Hellden L: **Occurrence of oral mucosal lesions, the influence of tobacco habits and an estimate of treatment time in an adult Swedish population**. *J Oral Pathol Med* 1990, **19**(4):170-176.
7. Wickholm S, Soder PO, Galanti MR, Soder B, Klinge B: **Periodontal disease in a group of Swedish adult snuff and cigarette users**. *Acta Odontol Scand* 2004, **62**(6):333-338.
8. Zendehdel K, Nyren O, Luo J, Dickman PW, Boffetta P, Englund A, Ye W: **Risk of gastroesophageal cancer among smokers and users of Scandinavian moist snuff**. *Int J Cancer* 2008, **122**(5):1095-1099.
9. Hergens MP, Alfredsson L, Bolinder G, Lambe M, Pershagen G, Ye W: **Long-term use of Swedish moist snuff and the risk of myocardial infarction amongst men**. *J Intern Med* 2007, **262**(3):351-359.
10. Hergens MP, Lambe M, Pershagen G, Terent A, Ye W: **Smokeless tobacco and the risk of stroke**. *Epidemiology* 2008, **19**(6):794-799.
11. Wikstrom AK, Stephansson O, Cnattingius S: **Tobacco use during pregnancy and preeclampsia risk: effects of cigarette smoking and snuff**. *Hypertension*, **55**(5):1254-1259.
12. Wrangsjö B, Winberg Salomonsson M: **Tonårstid : utveckling, problem och psykoterapeutisk behandling**, 1. utg. edn. Stockholm: Natur och Kultur; 2006.
13. Tajfel H, Turner JC: **The social identity theory of inter-group behavior**. Chigago: Nelson-Hall: Psychology of Intergroup Relations. Chigago: Nelson-Hall 1986.
14. Ajzen I: **The theory of planned behavior**. *Organizational Behavior and Human Decision Processes* 1991, **Vol.50**(2):pp.
15. McMillan B, Higgins AR, Conner M: **Using an extended theory of planned behaviour to understand smoking amongst schoolchildren**. *Addiction Research & Theory* 2005, **13**(3):293-306.
16. DiFranza JR, Rigotti NA, McNeill AD, Ockene JK, Savageau JA, St Cyr D, Coleman M: **Initial symptoms of nicotine dependence in adolescents**. *Tob Control* 2000, **9**(3):313-319.
17. Post A, Gilljam H, Rosendahl I, Bremberg S, Galanti MR: **Symptoms of nicotine dependence in a cohort of Swedish youths: a comparison between smokers, smokeless tobacco users and dual tobacco users**. *Addiction* 2010, **105**(4):740-746.
18. Morgan DL: **Focus groups as qualitative research**, 2. edn. Thousand Oaks, Calif.: Sage; 1997.
19. Kreuger RA, Casey, M **Focus Groups. A Practical Guide for Applied Research. 3rd ed.**, 3rd ed. edn. Thousand Oaks, California Sage Publications Inc; 2000.
20. Edvardsson I, Lendahls L, Landstinget Kronoberg: **Barns och ungdomars hälsa och levnadsvanor i Kronobergs län : en uppföljande enkätundersökning : en beskrivande rapport**. In. Växjö: Landstinget Kronoberg; 2010: 111, 120.
21. Graneheim UH, Lundman B: **Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness**. *Nurse Educ Today* 2004, **24**(2):105-112.
22. Stewart-Knox BJ, Sittlington J, Rugkasa J, Harrisson S, Treacy M, Abaunza PS: **Smoking and peer groups: results from a longitudinal qualitative study of young people in Northern Ireland**. *Br J Soc Psychol* 2005, **44**(Pt 3):397-414.
23. Harris JR: **Where is the child's environment? A group socialization theory of development**. *Psychological Review* 1995, **Vol.102**(3):pp.
24. Tajfel H: **Human groups and social categories : studies in social psychology**. Cambridge: Cambridge U.P.; 1981.
25. Noller P, Feeney JA, Peterson C: **Personal relationships across the lifespan**. Hove: Psychology Press; 2001.
26. Connell R: **Masculinities**. Berkeley: University of California Press; 1995.

27. Stjerna ML, Lauritzen SO, Tillgren P: **"Social thinking" and cultural images: teenagers' notions of tobacco use**. *Soc Sci Med* 2004, **59**(3):573-583.
28. Ambjörnsson F: **I en klass för sig : genus, klass och sexualitet bland gymnasietjejer**. Stockholm: Ordfront; 2004.
29. Doubeni CA, Reed G, Difranza JR: **Early course of nicotine dependence in adolescent smokers**. *Pediatrics* 2010, **125**(6):1127-1133.
30. Scragg R, Wellman RJ, Laugesen M, DiFranza JR: **Diminished autonomy over tobacco can appear with the first cigarettes**. *Addict Behav* 2008, **33**(5):689-698.
31. Nilsson M, Emmelin M: **"Immortal but frightened" - smoking adolescents' perceptions on smoking uptake and prevention**. *BMC Public Health* 2010, **10**(1):776.
32. Kitzinger J: **The methodology of Focus Groups: the importance of interaction between research participants**. *Sociology of Health & Illness* 1994, **16**(1):103-121.

Paper IV

Submitted

The social environment is most important for not using snus or smoking among adolescents

Ingrid Edvardsson[1], Lena Lendahls[2], Tobias Andersson[3], Göran Ejlertsson[4]

[1]Department of Clinical Sciences Malmö, Lund University, Sweden [2]Unit for Research and Development, Kronoberg County Council, Sweden [3]Kampinas gård 1, Angelstad, Sweden [4]School of Health and Society, Kristianstad University, Sweden

Abstract

Aims: To identify factors, which were related to being smoke-free and snus-free, respectively, among adolescents in relation to adolescents who were smoking and/or using snus, and determine if there were any sex differences. *Methods:* A questionnaire study was performed among students in year two in upper secondary schools (17-years olds) in southern Sweden in 2009. More than 2,200 students completed the questionnaire regarding health and living habits anonymously. The variables were tested by χ^2-test, before selection into the logistic model. Because of the salutogenic approach in the study, the results of the logistic regression analyses were expressed as Positive Odds Ratio (POR). *Results:* The prevalence of being smoke-free was 75.6 percent for girls and 70.2 percent for boys, whilst the prevalence of being snus-free was 95.1 percent for girls and 70.2 percent for boys. Having a tobacco-free best friend was the most important factor that correlated with being smoke- and snus-free as an adolescent, for both boys and girls. Good living habits, such as drinking less alcohol, were also central to being smoke-free and snus-free. *Conclusions*: The results show that a tobacco-free environment has a great influence on whether or not adolescents stay tobacco-free. As the environment has a big impact, the school has a big challenge to work with the school environment and policies but also with family responsibility, norms and attitudes to tobacco.

Key words: Adolescents, cross-sectional, salutogenic, snus-free, smoke-free, social environment.

Introduction

Studies have shown that smoking among teenagers is associated with different factors related to living habits and social environment. Parents influence their children through attitudes, behaviour and tobaccos habits and thus transfer whether smoking is acceptable or not. It is well known that smoke-free parents are less likely to have children who smoke [1, 2]. Also, parents' attitudes and active actions against smoking influence whether the children start smoking or not [3, 4]. Even tobacco use among close friends has a negative effect on tobacco habits among adolescents [5]. Older school mates, smokers or not, become important role models and have a large impact on teenagers and affect their tobacco habits [6]. Many people, especially smokers themselves, believe that smoking among teenagers of their own age is more common than it actually is [5, 7]. This misunderstanding can be seen as a risk factor, which facilitates a transition to becoming a smoker.

A large number of factors affect whether young people will be tobacco-free or not. The tobacco habits in the society and the individual's personal qualities are associated with tobacco use. Teenagers who smoke show low self-esteem to a greater extent. Furthermore, they show lower study progress and a feeling of estrangement in school [5] and they drink more alcohol than their smoke-free peers [8].

To use snus (the Swedish version of oral moist snuff) is a distinct male habit in Sweden. In the male population, 26 percent report snus-use, whereas only seven percent of females do this [9]. The same pattern is seen among adolescents, 24 percent for boys versus seven percent for girls in upper secondary school (17-year-olds) use snus [10]. The difference in tobacco use between the sexes decrease when smoking and snus-use are merged. The few studies about teenagers' debut using snus indicate that snus is introduced later than smoking [11, 12]. If an adolescent is a smoker, the probability to also becoming a snus-user is higher compared to a non-smoker. Adolescents who both smoke and use snus are more addicted to nicotine compared to those who only smoke [13]. One study in Sweden showed a correlation between fathers and their sons using snus [14]. Young people who use snus also drink more alcohol than tobacco-free teenagers [15].

Traditionally, most research has been about risk factors that are related to tobacco use. In this study, we have chosen a salutogenic perspective to find out what is related to being smoke- and snus-free, respectively, among adolescents. The method with positive odds ratios was first used and described in 2002 [16]. Salutogenesis implies a broad perspective with focus on resources, skills and opportunities and access to a social context in the form of family, friends and society structure [17]. An important role for health promotion is to strengthen individuals towards empowerment [18].

Aims

The aim of this study was to identify factors, which were related to being smoke-free and snus-free, respectively, among adolescents in relation to adolescents who were smoking and/or using snus, and determine if there were any sex differences.

Methods

Study population

A cross-sectional study was performed among students in year two of upper secondary schools in the autumn of 2009. The study was performed in southern Sweden, with 180,000 inhabitants in eight municipalities. All the 20 schools in the municipalities, both private and municipal, were included in the study. A majority of the students (66 percent) went to schools in the largest municipality.

The study comprised 2,666 students. Out of these, 2,238 students completed the questionnaire. The response rate was 83.9 percent. A majority of the students were 17 years old on the occasion of the survey, ten percent were younger and two percent were older.

Data collection

Information about the study was given through letters to and meetings with principals and school nurses at the participating schools. The questionnaires were sent to the schools, and the teachers distributed them to the students who completed them anonymously in school. Each student put the completed questionnaire in a sealed envelope. An attached form filled out by the teacher gave information on the number of students who participated, the number of students absent due to illness or other reasons and the number of students who refused to participate.

Questionnaire

The questionnaire consisted of 90 questions about health and living habits. Most of the questions were from the Swedish version of the WHO "Health behaviour in school-aged children" 2005/2006 report [19]. The questionnaire items on tobacco habits were the same as in the annual national survey of pupils in grade 9 and year two in upper secondary school conducted by CAN (The Swedish Council for Information on Alcohol and Other Drugs) [10]. These questions had been used on a similar target group and were thus established.

Dependent variables

The logistic regression analyses were made separately for girls and boys. The dependent variables were smoke- and snus-free, respectively. The question "Do you smoke?" had four alternative answers: 'Yes', 'No, I have quit', 'No, but I have tried' and 'No, I have never smoked'. The dichotomisation was done with the answer 'No, but I have tried' and 'No, I have never smoked' versus the rest, henceforth named smoke-free. Adolescents who are ex-smokers have a high rate of relapse [20] and in accordance to this, the answer 'No, I have quit' was linked to the smoker group.

The question "Do you use snus?" had seven different alternative answers: 'No, I have never tried snus', 'No, but I have tried', 'No, I have quit', 'Yes, very seldom', 'Yes, sometimes', 'Yes, nearly every day', 'Yes, every day'. In the analysis, the two first answers were dichotomized versus the rest henceforth named snus-free. Snus-users are dichotomized in the same way as smokers, which mean that those who answered 'No, I have quit' belong to the group snus-users.

All independent significant variables from the questionnaire were analysed against the outcome variables using χ^2 test for girls and boys, respectively.

Statistics

The computer-based SPSS program (version 17.0; SPSS Inc., Chicago. Ill) was used for all data analyses. Following the salutogenic approach to the study, factors associated with not smoking and not using snus were identified using the χ^2-test. Variables included in the model were those with a significant ($p < 0.20$) bivariate relation to the dependent variable and with low correlation ($r_s^2 < 0.20$) to each other. All explanatory variables were dichotomized according to their median value. Correlation was analysed using Pearson's r coefficient. The analyses were performed using a backward procedure, with a step-by-step elimination of non-significant predictor variables, until all remaining variables were significant. All analyses were performed with a sex-specific approach, and the results of the analyses are expressed as Positive Odds Ratio (POR) and 95 % Confidence interval (CI). In the logistic regression model for snus-use, 19 independent variables for girls and 22 variables for boys, were included. For smokers, 29 independent variables were included for girls and 28 for boys, see Table 1. As the variables snus/smoke-free best friend, brother and sister caused substantially increased numbers of missing values, separate analyses were performed to evaluate the importance of having snus/smoke-free friends and siblings. The Hosmer-Lemeshow test for goodness-of-fit was calculated, and the values for the final model are given. For all analyses, the level of significance was set at $p < 0.05$.

Table 1.Variables included in the logistic regression for both smoke-free and snus-free (inclusion is marked Sn=snus-free, Sm=smoke-free, G=girls, B=boys). The variables at the last step of the logistic regression are in bold type. Dichotomised variables, the positive part is mentioned first.

VARIABLES	TYPE OF DATA	DICHOTOMIZED
Sex	Nominal	Girl
		Boy
School program	Nominal	Theoretical program
		Practical program
Living with both parents	Nominal	Yes
		No
Family economy (Sm G B)	Ordinal: Very good (1) →	Good (1-2)
	very bad (5)	Not good (3-5)

Hookah smoking	Ordinal: Never (1) → more than 12 times (5)	Never (1) Sometimes (2-5)
Drink alcohol (two variables; drink often + binge drinking)	Ordinal: Drink often: Never (1) → once a week (6) Ordinal: Binge drinking: Never (1) → more than 10 times (5)	Less (drink often:1-4 or binge drinking:1-3) More (other options)
Physical activity (two variables; exercise + physical activity)	Ordinal: Exercise: Every day (1) → never (7) Ordinal: Physical activity: Every day (1) → never (7)	Active (exercice: 1-3 or physical activity: 1-2) Inactive (other options)
Member of sports association	Nominal	Yes No
Eating fruit (Sm G B, Sn B)	Ordinal: More than once a day (1) → never (7)	Often (1-3) Not often (4-7)
Eating vegetables (Sm G B)	Ordinal: More than once a day (1) → never (7)	Often (1-2) Not often (3-7)
Drink soft drink (Sm G B, Sn B)	Ordinal: More than once a day (1) → never (7)	Often (1-3) Seldom (4-7)
Eating breakfast	Ordinal: Every day (1) → never (5)	Every day (1) Not every day (2-5)
Eating school lunch (Sm G B)	Ordinal: Every day (1) → never (5)	Every day (1) Not every day (2-5)
Eating dinner afternoon (Sm G B, Sn G)	Ordinal: Every day (1) → never (5)	Often (1-2) Not often (3-5)
Smoking habits **-mother** -father **-sister** -brother **-best friend**	Nominal: no, yes	Non smoking (no) Smoking (yes)
Snus habits -mother -father -sister **-brother** **-best friend**	Nominal: no, yes	Not snus users (no) Snus users (yes)

Sex partners	Ordinal: None (1) → three or more (4)	Few (1-2) Not few (3-4)
Health	Ordinal: Very good (1) → bad (4)	Good (1-2) Not good (3-4)
Alert and happy	Ordinal: Every day (1) → Seldom or never (5)	Often (1-2) Seldom (3-5)
Calm and relaxed (Sm G B, Sn G)	Ordinal: Every day (1) → Seldom or never (5)	Often (1-2) Seldom (3-5)
Confident (Sm G)	Ordinal: Always (1) → never (5)	Often (1-2) Seldom (3-5)
Satisfied with his/her own body	Nominal: Too small (1), small (2), neither nor (3), fat (4), too fat (5), not thought about it (6)	Satisfied (3,6) Not satisfied (1-2, 4-5)
Satisfied with his/her own looks	Nominal: very good looking (1), fairly good (2) neither nor (3), not particularly good (4), not at all good looking (5), not thought about it (6)	Satisfied (1-2) Not satisfied (3-6)
Lonely (Sm G)	Ordinal: Always (1) → never (5)	Sometimes (1-4) Never (5)
Outside (Sn B)	Ordinal: Always (1) → never (5)	Sometimes (1-4) Never (5)
Helpless (Sm B, Sn G)	Ordinal: Always (1) → never (5)	Sometimes (1-4) Never (5)
Enjoys (life) (Sm G B, Sn B)	Ordinal: Very much (1) → not at all (4)	Well (1-2) Not so much (3-4)
Bully (victimizer)	Ordinal: Never (1) → has bullied several times (3)	Never (1) Sometimes (2-3)
Is bullied (Sm G B, Sn B)	Ordinal: Never (1) → has been bullied several times (3)	Never (1) Sometimes (2-3)
Likes school (Sm G B, Sn B)	Ordinal: Very much (1) → not at all (4)	Much (1-2) Not much (3-4)
Stress at school (Sm G B)	Ordinal: very calm (1) → very stressed (4)	Stressed (1-2) Not stressed (3-4)
Non-attendance at school	Ordinal: Never (1) → several days a week (6)	Little (1-2) Often (3-6)

Ethics

Before the start of the study, ethical approval was given by the County Council's local ethics committee. The participants were informed in advance, and at the time for the questionnaire, about the aims and that participation in the study was voluntary. The questionnaire was to be administered anonymously in the classroom and no personal details were to be identifiable in any other way. The design of the questions was such that infringement of personal integrity should be minimal. The study was conducted in agreement with the Swedish Law of Research Ethics, SFS 2003:460.

Results

Out of the 2,238 respondents, 1,110 were girls and 1,128 were boys. The tobacco habits among the respondents can be seen in Table 2.

Table 2. Tobacco habits among the respondents

	Girls		Boys	
	n=1107	%	n= 1112	%
Smoke-free	837	75.6	856	77
Smokers	270	24.4	256	23
	Girls		Boys	
	n=1107	%	n= 1112	%
Snus-free	1032	95.1	774	70.2
Snus-users	53	4.9	328	29.8

Our results indicate that there was a difference between boys and girls with regard to being snus-free, Table III. To be together with a snus-free best friend has the highest relationship for both sexes (POR 10.10 for girls, 7.32 for boys) followed by drinking less alcohol (POR 5.28 for girls, 6.19 for boys). Being snus-free was related to a snus-free mother and sister among girls, while being snus-free was influenced by a brother and father among snus-free boys. Another difference was that boys had influencing factors related to school attendance, not bullying and being a member of a sport association, while being a snus-free girl was related to good health.

There were many identically related variables for being smoke-free for the two sexes. As shown in Table IV, having a smoke-free best friend was the variable with the highest POR for both sexes (POR 7.03 for girls, 9.03 for boys). To drink less alcohol and being smoke-free was related for both sexes (POR 3.97 for girls, 3.17 for boys) as well, just like living with both parents (POR 1.54 for girls, 1.68 for boys). The experience of having good health and regular eating habits were influencing variables for boys but not for girls.

Table 3. Varibales related to being snus-free, POR and 95% CI for girls and boys, respectively. Significant figures are in bold.

	Girls (n=1003)		Boys (n=954)	
SNUS-FREE	POR	95% CI	POR	95% CI
Drinks alcohol: less	**5.28**	**1.55 – 17.96**	**6.19**	**3.65 – 10.49**
Snus-free mother: yes	**3.14**	**1.02 – 9.65**	0.63	0.28 – 1.43
Health: good	**3.12**	**1.64 – 5.95**	1.17	0.64 – 2.13
Smokes hookah: never	**2.37**	**1.12 – 5.01**	**2.74**	**1.89 – 3.97**
Sex partners: few	**2.36**	**1.27 – 4.38**	**1.90**	**1.35 – 2.66**
Bullies: never	2.77	0.94 – 8.18	**1.83**	**1.16 – 2.88**
Non-attendance at school: little	1.77	0.93 – 3.36	**1.60**	**1.16 – 2.23**
Member of sports association: yes	1.27	0.57 – 2.81	**1.80**	**1.30 – 2.49**
Snus-free father: yes	0.97	0.48 – 1.95	**1.60**	**1.15 – 2.23**
Snus-free best friend: yes*	**10.10**	**5.00 – 20.17**	**7.32**	**5.05 – 10.62**
Snus-free sister: yes**	**4.87**	**1.48 – 16.05**	2.41	0.87 – 6.24
Snus-free brother: yes***	1.97	0.92 – 4.22	**3.32**	**2.06 – 5.36**

Hosmer and Lemeshow test for the analysis about snus-free were 0.948 for girls and 0.034 for boys and Nagelkerke R Square 0.186 and 0.325, respectively.

* Girls n= 961 Boys n= 889

** Girls n= 571 Boys n= 633

*** Girls n= 598 Boys n= 633

Table 4. Variables related to being smoke-free, POR and 95% CI for girls and boys, respectively. Significant figures are in bold.

	Girls (n= 963)		Boys (n=945)	
SMOKE-FREE				
	POR	95% CI	POR	95% CI
Drinks alcohol: less	**3.97**	**2.43 – 6.56**	**3.17**	**1.82 – 5.53**
Member of sports association: yes	**3.14**	**2.05 – 4.83**	**2.80**	**1.90 – 4.12**
Smokes hookah: never	**2.46**	**1.64 – 3.69**	**2,83**	**1.83 – 4.36**
Smoke-free mother: yes	**2.25**	**1.45 – 3.49**	**1.82**	**1.15 – 2.87**
Non-attendance at school: little	**2.18**	**1.48 – 3.28**	**1.97**	**1.36 – 2.84**
Sex partners: few	**2.09**	**1.39 – 3.16**	**2.40**	**1.64 – 3.52**
Smoke-free father: yes	**1.95**	**1.25 – 3.03**	1.51	0.93 – 2.44
Eats breakfast: every day	**1.90**	**1.29 – 2.77**	**1.74**	**1.20 – 2.51**
Satisfied with his/her body: yes	**1.68**	**1.12 – 2.51**	0.92	0.62 – 1.36
Drinks soft drinks: no	**1.60**	**1.06 – 2.35**	1.45	0.95 – 2.01
Lives with both parents: yes	**1.54**	**1.05 – 2,24**	**1.68**	**1.15 – 2.47**
Health: good	1.27	0.77 – 2.11	**2.59**	**1.49 – 4.50**
Eats dinner, afternoon: yes	0.93	0.60 – 1.44	**1.90**	**1.24 – 2.91**
Smoke-free best friend: yes*	**7.03**	**4.74 – 10.41**	**9.03**	**5.88 – 13.86**
Smoke-free sister: yes**	**3.40**	**1.92 – 6.02**	1.72	0.95 – 3.12
Smoke-free brother: yes***	**1.76**	**1.03 – 2.99**	**2.77**	**1.47 – 5.23**

Hosmer and Lemeshow test for the analysis of smoke-free were 0.407 for girls and 0.256 for boys and Nagelkerke R Square 0.460 0.386, respectively.

* Girls n= 962 Boys n= 864

** Girls n= 557 Boys n= 601

*** Girls n= 594 Boys n= 583

Discussion

Traditionally, most studies are focused on risk-factors for being a smoker. This study turns the perspective around. It has a salutogenic approach and therefore studies variables that relate to being smoke-free and snus-free, respectively. It is important to learn why young people can remain tobacco-free. An important main goal of health promotion is creating supportive environments thus it makes it easier for individuals to take responsibility for their choices. A key concept is empowerment seen as a process through which people gain greater control over decisions and actions, which affect their health [21]. The schools have a key role in developing a health promotion arena to help adolescents make healthy choices in order to have good living habits, but also to strengthen the individual recourses and the adolescent's self-efficacy.

Understanding why adolescents have not used tobacco could help researchers develop strategies for designing health-promotion programs to reach teenagers before they begin experimenting with tobacco and to assist those who start using tobacco [22]. The most important task is not to identify single risk factors and remove them, but to be one step ahead of them. The health promotion interventions must focus on how to decrease the total burden of risk factors and increase the access to protective factors. This study can also give support to the idea and approach of health-promoting environments for adolescents. The schools' tobacco or health policy must include the overall environment and people's living habits.

Since snus-use is primarily a male habit limited to Scandinavia, there are not many studies focused on gender differences [9, 10]. Our study indicates that important protective factors for being free from snus-use are absence of snus in the near environment and generally healthy living habits. Obviously, the strongest factor related to being snus-free, for both girls and boys, is to have a snus-free best friend. Distinct differences between the sexes were also seen in such a way that male (father, brother) snus-free models influence boys, while female (mother, sister) snus-free models were related to girls being snus-free. An unpublished study verifies that boys expressed that snus-use was very masculine (Author, submitted). One limitation in the results was the poor Hosmer and Lemeshow test value for snus-free boys. Possibly there is an extended set of potential predictors.

This study showed that a smoke-free best friend was clearly the strongest factor related to being smoke-free for both sexes. To the best of our knowledge, no references from other studies can confirm the finding that smoke-free relations are important for remaining smoke-free. However, many studies confirm that smoking in the near environment is more common among smokers [5]. Our study showed that the correlation was weaker with regard to smoke-free or snus-free parents compared to best friend. The social influence is not only if parents and/or friends use tobacco or not, but norms are also important. Parents and peers influence the adolescents' behaviour and intention to become a smoker through different processes. Descriptive norms influence the teenagers' behaviour to a greater extent than subjective norms, while subjective norms have a greater impact on the intention to smoke. A study has shown that parents have an effect on both descriptive and subjective norms, but peers only

influence descriptive norms of smoking behaviour [23]. Peer influences are more important for teenagers, then influences from parents. It is not surprising that adolescents who live with both parents are less likely to smoke than those who live with one parent, since there is a larger proportion of single parents who smoke [24].

All tobacco-free environments are resources for keeping adolescents tobacco-free. The results of this study indicate that being a member of a sports association is a related factor for both smoke-free girls and boys, as well as snus-free boys. Therefore, sports associations may be important as health promotion arenas and they have a responsibility to declare their support for a healthy life-style. A social context may imply protective factors or the other way around. In Sweden, for example, some sports (e.g. ice hockey) are associated with the use of snus [25]. One study showed that adolescents participating in team sports had a lower incidence of tobacco use compared to those involved in technical or strength sports [26]. The analysis of this study did not differentiate between the various types of sports activities, just membership in a sports association.

The relationship between low alcohol consumption and to be snus-free is stronger than being smoke-free. A previous Swedish study has shown that boys who use snus have an estimated alcohol intake that is five times higher than that of tobacco-free boys [15]. The friends that non-smokers associate with seem to have norms and habits mainly similar to their own. To have a smoke-free best friend interacts with low alcohol consumption, and one explanation for this can be that non-smokers consume less alcohol than smokers do [27], and this is also seen as a related factor in this study. This indicates that social factors in the near environment are important protective factors for both sexes being tobacco-free.

Having good health is more common among smoke-free boys and snus-free girls. This relationship cannot be seen for smoke-free girls, and a reason for this could be that even smoke-free girls report poor health to a greater extent than boys do in our study. Other studies confirm that good health is reported to a higher degree among tobacco-free adolescents than among tobacco users, but also that boys report good health more often than girls do [28]. There are probably other factors that have a greater impact on girls to be smoke-free than those found in our study.

From this study's results, a larger number of social environmental factors are found for smoke-free girls than for boys. The results also show that more variables are related to being smoke-free compared to being snus-free. An explanation to this may be that the smoke-free group is larger than the snus-free group for both sexes, especially for girls, where only five percent are snus-users. Even in national surveys, snus-use is less common among girls [10].

This study is a comprehensive, cross-sectional study of students in the second year of upper secondary school. Reasons for the high participation rate of 84 percent may be that the survey was conducted during school hours, and that the students responded anonymously. The reasons not to participate were illness or not accepted absence, but the student could also choose to abstain from participation even if they were present.

There is always a risk that self-reported smoking habits among young people are believed to be under-reported. According to a Swedish study, there was a 98 percent concordance between self-reported smoking habits and cotinine in saliva [29]. There is no reason to believe that it would be different for snus-use.

For both sexes, an association exists between being smoke-free and snus-free ($p < 0.001$), and these variables are therefore not included as independent variables in the analysis. If snus-users had been excluded from the smoke-free group, the group had been tobacco-free. Since the aim was to study the factors related to being smoke-free and snus-free, respectively, in comparison to those who were smoking or using snus, respectively, the smoke-free group may include snus-users, and the snus-free group may include smokers. One indication for this was that smoking was also a risk factor for starting to use snus, and vice-versa [13].

There are not many studies available on the salutogenic perspective of tobacco habits, and the lack of studies is obvious when it comes to snus-use. In this study, we used a traditional questionnaire but tried to look at the results from a salutogentic perspective. Therefore, data were presented as POR in order to focus on the predictors of being smoke- or snus-free, instead of the traditional way of studying why people smoke or use snus. However, there are difficulties involved in proceeding from a salutogenetic perspective in a traditional questionnaire. It is a challenge to find measurement methods with a salutogenic approach to adolescents' living habits and health, and how to find resources and positive factors and not only ask for risk factors. The results showed to what degree each factor was protective with regard to remaining smoke- or snus-free, compared to not having this protective factor. The results showed a relationship between being smoke-free or snus-free among adolescents, and they attempt to explain in a new way why many adolescents do not use tobacco.

Conclusions

The results show that a tobacco-free environment has a major influence on whether or not adolescents remain tobacco-free. As the environment has a large impact, the school has a great challenge to work not only with the school environment and policies but also with family responsibilities, norms and attitudes to tobacco. A health-promoting school can be characterized as being a school that is constantly strengthening its position as a healthy setting for learning and working to give strength to and support healthy choices. Because of its salutogenic approach, this study is unique and may contribute to new ways of looking at tobacco prevention and adopt a health-promotion view that focuses on resources at both individual and group levels. There is a need for further research to explore why some adolescents remain tobacco-free, and to develop new strategies with a health-promotion approach. As part of this, there is need to develop an instrument for measuring salutogenetic factors for adolescents.

References

1. Murray M, Kiryluk S, AV S. **Relation between parents´and children´s smoking behaviour and attitudes**. *Journal of Epidemiology and Community Health*. 1985;**39**:169-74.
2. Scragg R LM. **Influence of smoking by family and best friend on adolescent tobacco smoking: results from the 2002 New Zealand national survey of Year 10 students**. *Australian and New Zealand journal of public health*. 2007;**31**(3):217-23.
3. Andersen MR, Leroux BG, Bricker JB, Rajan KB, AV P. **Antismoking parenting practices are associated with reduced rates of adolescent smoking**. *Jr Arch Pediatr Adolesc Med*. 2004;**Apr;158(4)**:348-52.
4. Sargent JD DM. **Does Parental disapproval of smoking prevent adolescents from becoming established smokers?** *Pediatrics*. 2001;**108**:1256-62.
5. U.S. Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2012.: 2012.
6. Bricker JB AM, Rajan KB, Sarason IG Peterson Jr AV. **The role of schoolmates´smoking and non-smoking in adolescents´ smoking transitions: a longitudinal study**. *Addiction*. 2007;**102**:1665-75.
7. Conrad KM, Flay BR, Hill D. **Why children start smoking cigarettes: predictors of onset**. *Br J Addict*. 1992;**87**(12):1711-24.
8. Wetzels JJ, Kremers SP, Vitória PD, H dV. **The alcohol-tobacco relationship: a prospective study among adolescents in six European countries.** *Addiction*. 2003;**98**:1755-63.
9. Boström G. **Hälsa på lika villkor http://www.fhi.se/templates/Page____12661.aspx**. 2007.
10. Henriksson C, Leifman H. Skolelevers drogvanor. Stockholm: Centralförbundet för alkohol- och narkotikaupplysning; 2011. 1 PDF-fil (260) p.
11. Edvardsson I, Lendahls L, Hakansson A. **When do adolescents become smokers? Annual seven-year population-based follow-up of tobacco habits among 2000 Swedish pupils--an open cohort study**. *Scand J Prim Health Care*. 2009;**27**(1):41-6.
12. Galanti MR, Rosendahl I, Wickholm S. **The development of tobacco use in adolescence among "snus starters" and "cigarette starters": an analysis of the Swedish "BROMS" cohort**. *Nicotine Tob Res*. 2008;**10**(2):315-23.
13. Haukkala A, Vartiainen E, H Vd. **Progression of oral snuff use among Finnish 13-16-year-old students and its relation to smoking behaviour**. *Addicion*. 2006;**101**: 581-9.
14. Rosendahl KI, Galanti MR, Gilljam H, Ahlbom A. **Smoking mothers and snuffing fathers: behavioural influences on youth tobacco use in a Swedish cohort**. *Tob Control*. 2003;**12**(1):74-8.
15. Wickholm S GM, Söder B, Gilljam H. **Cigarett smoking, snuff use and alcohol drinking: coexisting risk behaviours for oral health in young males**. *Community Dentistry and Oral Epidemiology*. 2003;**31**:269-74.
16. Ejlertsson G, Eden L, Leden I. **Predictors of positive health in disability pensioners: a population-based questionnaire study using Positive Odds Ratio**. *BMC Public Health*. 2002;**2**:20.
17. Lindstrom B, Eriksson M. **From health education to healthy learning: implementing salutogenesis in educational science**. *Scand J Public Health*. 2011;**39**(6 Suppl):85-92.
18. Koelen MA, Lindstrom B. **Making healthy choices easy choices: the role of empowerment**. *Eur J Clin Nutr*. 2005;**59 Suppl 1**:S10-5; discussion S6, S23.
19. Currie C, University of Edinburgh. Child & Adolescent Health Research Unit, Health Behaviour in School-aged Children (Network), World Health Organization. Regional Office for Europe. Inequalities in young people's health HBSC international report from the 2005/2006 survey. Copenhagen: World Health Organization, 2008.
20. Bancej C, O'Loughlin J, Platt RW, Paradis G, Gervais A. **Smoking cessation attempts among adolescent smokers: a systematic review of prevalence studies**. *Tob Control*. 2007;**16**(6):e8.
21. Nutbeam D. Health Promotion Glossary. Geneva: World Health Organisation; 1998.
22. Kulbok PA, Rhee H, Botchwey N, Hinton I, Bovbjerg V, Anderson NL. **Factors influencing adolescents' decision not to smoke**. *Public Health Nurs*. 2008;**25**(6):505-15.
23. Vitoria PD, Salgueiro MF, Silva SA, de Vries H. **Social influence, intention to smoke, and adolescent smoking behaviour longitudinal relations**. *Br J Health Psychol*. 2011;**16**(4):779-98.
24. Statens folkhälsoinstitut. Folkhälsopolitisk rapport 2010 : framtidens folkhälsa - allas ansvar. Stockholm: Statens folkhälsoinstitut; 2010. 174 p.
25. Rolandsson M, Hugoson A. **Changes in tobacco habits. A prospective longitudinal study of tobacco habits among boys who play ice hockey**. *Swed Dent J*. 2003;**27**(4):175-84.
26. Wichstrom T, Wichstrom L. **Does sports participation during adolescence prevent later alcohol, tobacco and cannabis use?** *Addiction*. 2009;**104**(1):138-49.

27. Wetzels JJ, Kremers SP, Vitoria PD, de Vries H. **The alcohol-tobacco relationship: a prospective study among adolescents in six European countries**. *Addiction*. 2003;**98**(12):1755-63.
28. Nygren K, Janlert U, Nygren L. **Norm compliance and self-reported health among Swedish adolescents**. *Scand J Public Health*. 2011;**39**(1):44-50.
29. Post A GH, Rosendahl I, Meuling L, Bremberg s, Galanti MR. **Validity of self reports in a cohort of Swedish adolescent smokers and smokeless tobacco (snus) users**. *Tobacco Control*. 2005;**14**:114-7.