Folkhälsomyndigheten
PUBLIC HEALTH AGENCY OF SWEDEN

Knowledge about the harmful effects of tobacco and nicotine products

Report on a Government assignment

Article number: 24256

About this publication

This is a report on the Government assignment to compile and make the knowledge on the various harmful effects of tobacco and nicotine products available. The assignment was received by the Public Health Agency of Sweden, the National Board of Health and Welfare and the Swedish Agency for Health and Technology Assessment and Assessment of Social Services (SBU) on 24 March 2022 (S2022/01825). According to the amendment to the assignment on 23 February 2023, the harmful effects of different types of products shall be described in relation to each other, based on the authorities' compilation of available knowledge (S2022/01825 in part).

In this report we have compiled the knowledge on the harmful effects of tobacco and nicotine products with special reference to equity in health and the protection of children and young people.

The primary target group for the report is the Government, but the knowledge may also be useful for other actors working with issues related to tobacco and nicotine at local, regional or national levels.

The work has been coordinated by the Public Health Agency of Sweden who has had principal responsibility for creating the report. The assignment has been carried out in collaboration with the National Board of Health and Welfare and SBU.

Public Health Agency of Sweden

Karin Tegmark Wisell
Director-General

Table of contents

Abbreviations

HTP: Heated Tobacco Products

IHE: The Swedish Institute for Health Economics

COPD: Chronic Obstructive Pulmonary Disease

WHO: World Health Organization

Glossary

Snus (moist tobacco): Today there are different types of snus that vary in content and in how the products are regulated. In this report, “snus” is the term used regardless of what type it is.

Tobacco snus: used to describe snus containing tobacco and nicotine.

Nicotine pouches: used to describe snus that only contains nicotine.

Summary

This report is a compilation of existing knowledge about the harmful effects of tobacco and nicotine products in terms of the extent of their use, the health risks and the social costs. The harmful effects are described in relation to each other, based on the scientific evidence.

An increasing number of people are using snus and e-cigarettes

Tobacco smoking in the Swedish population has decreased since the 1980s, while the use of snus has increased in recent years after having remained relatively unchanged for some time. Among young people, the use of e-cigarettes and nicotine pouches is increasing. At the same time, there are still many young people who smoke tobacco. We can also see that people who use snus or e-cigarettes are more likely to start smoking tobacco. Today there are significant differences in the use of tobacco and nicotine in terms of, for example, gender, age and educational level, and such disparities contribute to health inequalities in the population.

The scientific evidence concerning health risks varies

The compilation shows that the scientific evidence concerning the health risks of using tobacco and nicotine products varies, depending on how long a product has been on the market, the number of people using it and the amount of research available.

Tobacco for smoking has a long history and there is strong scientific evidence that smoking tobacco increases the risk of, e.g., cancer, cardiovascular disease, type 2 diabetes and complications during pregnancy. The evidence is more limited in the case of other types of products. E-cigarettes have been used for a relatively short period of time, and there is therefore a lack of knowledge regarding several possible health risks, in particular long-term risks. However, short-term we can see that their use may affect heart rhythm and blood pressure and impair blood vessel function. The scientific evidence is also more limited regarding products that are not widespread globally, such as snus. Available research suggests that use of tobacco snus may increase the risk of high blood pressure, type 2 diabetes and death following a heart attack or stroke. Using snus during pregnancy may increase the risk of foetal or neonatal complications. There is an absence of scientific evidence about nicotine pouches, but all tobacco and nicotine products contain nicotine, which is acutely toxic and highly addictive.

The absence of studies, or that the available evidence is too uncertain to determine whether there is an association or not, does not mean that risks can be ruled out. All tobacco and nicotine products may result in addiction and entail health risks, although tobacco smoking is linked to especially high levels of risk.

Limited knowledge about harmful effects on society

We lack an overall, comprehensive picture of the harmful effects of tobacco and nicotine products at a societal level. Nor is there a current estimate of how many people in Sweden become ill and die due to tobacco and nicotine use. There is some evidence of the costs to society due to tobacco smoking, of which healthcare resources constitute a significant portion.

Important to protect children and young people

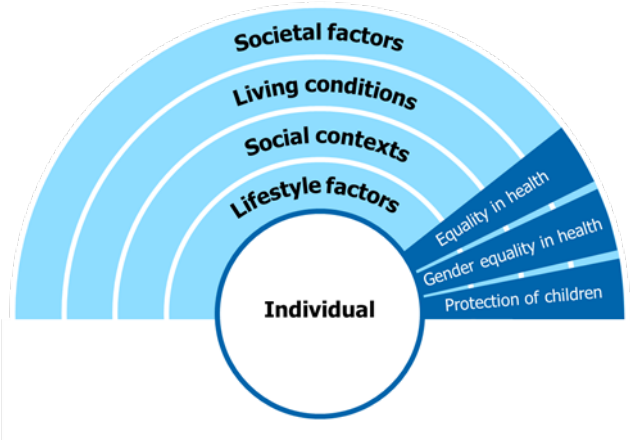
It takes time to gather scientific evidence on health risks and for certain products we therefore need to base our knowledge on information related to the harmful substances included in these products. We should also take into account how the use is developing, such as the increased use of e-cigarettes and nicotine pouches among young people. Children and young people are especially vulnerable. Addiction often develops at an early age, and young people who use e-cigarettes or snus may eventually start smoking. We can see that a regulation of the tobacco and nicotine products that is more similar to the legislation that exists for tobacco smoking would reduce both accessibility and demand in a way that would contribute to better protection for children and young people.

Introduction

Inequality in health can be described as systematic differences in health between groups with different socio-economic positions, expressed as, for example, level of education, income or occupation (1). In 2018, the Swedish parliament, as part of its framework for public health, adopted the goal of creating societal preconditions for good and equitable health and to close avoidable health gaps within one generation.

People's lifestyle affects the risk of developing many of the illnesses that have the greatest impact on the burden of disease in Sweden today: cardiovascular disease, cancer, type 2 diabetes and chronic obstructive pulmonary disease (COPD) (3, 4). The habits that primarily contribute to this disease burden are smoking, unhealthy eating habits, alcohol use and insufficient physical activity, although other habits also play a role (5). Individual room for action to choose a healthy lifestyle is influenced by conditions in society, personal circumstances and living conditions (6) (Figure 1).

Figure 1. Health determinants



Source: Dahlgren and Whitehead 1991 (6), further developed by the Public Health Agency of Sweden

The use of tobacco and nicotine products is affected by supply and demand, attitudes to their use and the available cessation support. Use of these products can be reduced, e.g., by increased prices (7), preventative interventions in schools (7), distribution of information on the harmful effects of the products (7), and limiting the use of added flavours (8, 9).

Tobacco and nicotine products in Sweden

Different types of tobacco and nicotine products are sold in Sweden. The products have been on the market for varied lengths of time; some are meant to be smoked while others are non-smokable. All tobacco products also contain nicotine.

Products for smoking

Tobacco products for smoking or where the method of use is similar to smoking that are available on the market in Sweden include cigarettes, cigarillos, roll-your-own tobacco, cigars, pipe tobacco, heated tobacco products (HTP) and water pipe tobacco. In heated tobacco products, the tobacco is heated by a battery. A water pipe is a product that can be used both with and without tobacco and nicotine content in the smoked mass

Smoked nicotine products include electronic cigarettes (e-cigarettes) and water pipe without tobacco in the smoked mass. E-cigarettes have been available on the Swedish market since the 2010s and contains a smokeable liquid.

Non-smokeable products

Tobacco snus is a non-smokeable product. Tobacco snus is banned for sale in many countries but can be sold in Sweden, Norway, Iceland and the USA. Nicotine pouches is a new snus product, which was launched in Sweden in the mid-2010s.

Other tobacco-free nicotine products are also available on the market, such as nicotine sprays and nicotine strips.

Regulation of tobacco and nicotine products

Regulation is an effective tool for reducing the supply of and demand for tobacco and nicotine products, for example in terms of age control and ban on marketing (7). Table 1 summarises the regulation of different tobacco and nicotine products in Sweden (10, 11). Cigarettes and roll-your-own tobacco are the most regulated products.

Table 1. An overall summary of how tobacco and nicotine products are regulated in Sweden

Regulations	**Cigarettes, roll-your own tobacco**	**Hookah tobacco**	**Cigars, cigarillos, etc.**	**E-ciga-rettes**	**Heated tobacco products**	**Tobacco snus, chewing tobacco, etc.**	**Tobacco free nicotine products**
Age check	Required	Required	Required	Required	Required	Required	Required
General health warning	Required	Required	Required	Required	Required	Required	Required
Combined health warning	Required	Required	–	–	–	–	–
Text warning	Required	Required	Required	–	–	–	–
Information message	Required	Required	–	–	–	–	–
Smoking cessation information	Required	Required	Required	–	–	–	–

Regulations	Cigarettes, roll-your own tobacco	Hookah tobacco	Cigars, cigarillos, etc.	E-ciga-rettes	Heated tobacco products	Tobacco snus, chewing tobacco, etc.	Tobacco free nicotine products
Leaflet with information on, e.g., adverse effects	–	–	–	Required	–	–	–
Advertising targeted at consumer (a)	Prohibited	Prohibited	Prohibited	–	Prohibited	Prohibited	-
Advertising targeted at young consumers	–	–	–	–	–	–	Prohibited
Euphemistic branding	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
Regulation of nicotine content (b)	Required	–	–	Required	–	–	–
Covered by smoke free environments	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited	–	–
Additive flavouring that imparts characterising flavour	Prohibited	–	–	–	–	–	–
References to additives or scent	Prohibited	Prohibited	Prohibited	Prohibited	–	–	–
Application for licence to sell	Required	Required	Required	–	Required	Required	–
Notification of sale	–	–	–	Required	–	–	Required
Labelling with traceability and security features	Required	Required from 20 May 2024	Required from 20 May 2024	–	Required from 20 May 2024	Required from 20 May 2024	–

a.) Essentially a total consumer marketing ban, some consumer marketing at point of sale is permitted, the regulation varies depending on the product.

b.) The nicotine level is regulated in manufactured cigarettes. The highest emission level is 1 mg of nicotine per cigarette.

Broad-based and long-term collaborative interventions

The preventative work involves broad-based and long-term interventions in collaboration between different actors at the international, national, regional and local levels.

Swedish tobacco and nicotine preventative work is based on several different regulatory documents. At the international level, there is the World Health Organization (WHO) Framework Convention on Tobacco Control, intended to prevent the use of tobacco, with roughly 180 participating countries (12), and the EU's Tobacco Products Directive concerning the manufacturing, presentation and sale of tobacco and tobacco related products. The UN 2030 Agenda for Sustainable Development (14) and the UN Convention on the Rights of the Child (Children's Convention) (15) are also important. At the national level, there are two comprehensive regulatory documents: the national public health policy with its eight target areas (2) and the Alcohol, Narcotics, Doping, Tobacco and Gambling (ANDTS) strategy 2022-2025 (16).

About the assignment

In March 2022, the Government commissioned the Public Health Agency of Sweden, the National Board of Health and Welfare and SBU to compile and make the knowledge on the harmful effects of various tobacco and nicotine products available (S2022/01825). The content should be based on scientific foundation and be presented in a consolidated and accessible way in line with the purpose of the assignment. The assignment is coordinated by the Public Health Agency of Sweden.

An amendment to the assignment in February 2023 stipulates that the harmful effects of different products must also be described in relation to each other, based on the agencies' compilation of available knowledge (S2022/01825 partial). When carrying out the assignment, Sweden's obligations such as those under Article 5.3 of the WHO Framework Convention on Tobacco Control must be taken into account.

Aim and starting points

The aim of the assignment is to compile and present existing knowledge on the harmful effects of tobacco and nicotine products and to describe these harmful effects in relation to each other based on scientific evidence.

The use of tobacco and nicotine products may contribute to different types of harmful effects for those that use them or are in some other way are exposed to them. A person who uses a product may also be at an increased risk of using another addictive product. Harmful effects of use may also be reflected in the burden of disease and mortality and may lead to increased social costs. In this report we include knowledge about:

- use of tobacco and nicotine products
- health risks associated with the use of tobacco and nicotine products
- associations between the use of different tobacco and nicotine products
- diseases of significance for the population's health status where the use of tobacco and nicotine may be a contributing factor.
- social costs due to the use of tobacco and nicotine products.

Special attention is given to the protection of children and young people and to equity in health.

Delimitations

The report is based on the following delimitations:

- We only describe harmful effects of tobacco and nicotine products that are subject to legislation that existed when the assignment was given or had already been proposed by the Government.
- Approved medical nicotine products are not included.
- Environmental impacts linked to manufacturing, transport and waste products of tobacco and nicotine are not included.
- Research linked to commercial interests or other interests in the tobacco and nicotine industry is not included, in accordance with Article 5.3 of the WHO Framework Convention on Tobacco Control.

Method

In this report, we present a compilation of the harmful effects of tobacco and nicotine products with special reference to equity in health and the protection of children and young people.

In line with the assignment, the compilation of harmful effects is primarily based on current knowledge from participating agencies, but to provide a picture of the state of knowledge that is as up to date as possible we have also surveyed, primarily, any systematic literature reviews that have been produced. Appendix 1 contains more information on our work process.

However, for several products the scientific evidence is limited, and the state of knowledge may change as new studies are published. It is important, when new individual studies are produced, to review these together with previous research. Therefore, it is important to continue to monitor and compile new research on health risks.

Systematic literature reviews

A systematic literature review is a compilation of research on a specific issue. It is based on a predefined method for searching for and selecting scientific studies that meet certain criteria for relevance and quality. The objective of a systematic literature review is to provide a picture of the research in an area that is as comprehensive and reliable as possible.

For tobacco and nicotine use we use national surveys and registries that continuously measure use and exposure in Sweden. Data on care related to tobacco and nicotine use and the prevalence of tobacco and nicotine related diagnoses and diseases are primarily based on the National Board of Health and Welfare's national data sources.

The Public Health Agency of Sweden has coordinated the work and has had the principal responsibility for creating this report. SBU has contributed by providing the results from its report on links between snus (moist tobacco), e-cigarettes and tobacco smoking (17). In addition, SBU has assisted the Public Health Agency of Sweden by providing an overall assessment of the reviews that have been included in the supplementary mapping of literature (Appendix 1). The National Board of Health and Welfare has contributed by compiling current knowledge on care related to tobacco and nicotine use and the prevalence of tobacco and nicotine related diagnoses and diseases (appendix 2), and data on the use of tobacco during pregnancy.

Use of tobacco and nicotine products

In this chapter we describe the use of tobacco and nicotine products in Sweden. Who and how many the users of the products are, and how the use has developed over time, helps provide a picture of the harmful effects of these products.

Tobacco smoking has been decreasing for some considerable time.

The proportion of people who smoke tobacco daily has long been decreasing among both women and men (18, 19). In 2022, 6 percent of the population aged 16-84 stated that they smoke every day. Occasional smoking is almost as common as daily smoking (18).

The proportion of pregnant women stating, at registration for maternity care, that they smoke daily has been decreasing since the early 2000s and was just over 3 percent in 2021 (20).

There are still many young people who smoke

In the 16-29 age group, 4 percent state that they smoke daily. Just over 8 percent smoke sometimes, which is higher than in older age groups (18).

In the second year of upper-secondary school, 20 percent smoke daily, almost daily or occasionally. This proportion has been decreasing since 2012, but a small increase was observed in 2022 compared to the previous year. In year 9 of the compulsory school, 9 percent of students smoke (21).

Big differences in daily smoking between different groups

Although daily tobacco smoking has decreased, there are still obvious differences between groups. For example, daily smoking is nearly five times as common among people with compulsory school education compared with those with a post-secondary education (18). Differences can also be noted among young people from different social groups. A smoking debut at or before the age of 13 and more regular smoking are more common among students of lower socio-economic status (22).

The use of snus has increased in the last few years

In Sweden, 20 percent of men and 7 percent of women aged 16-84 report using snus every day. In the last few years, the use of snus has increased, after having long remained relatively unchanged (18).

Snus (moist tobacco) is primarily used by men, and most people who use snus do it every day. The use of nicotine pouches is different, with roughly the same proportion women as men. Daily use and occasional use are roughly equally common.

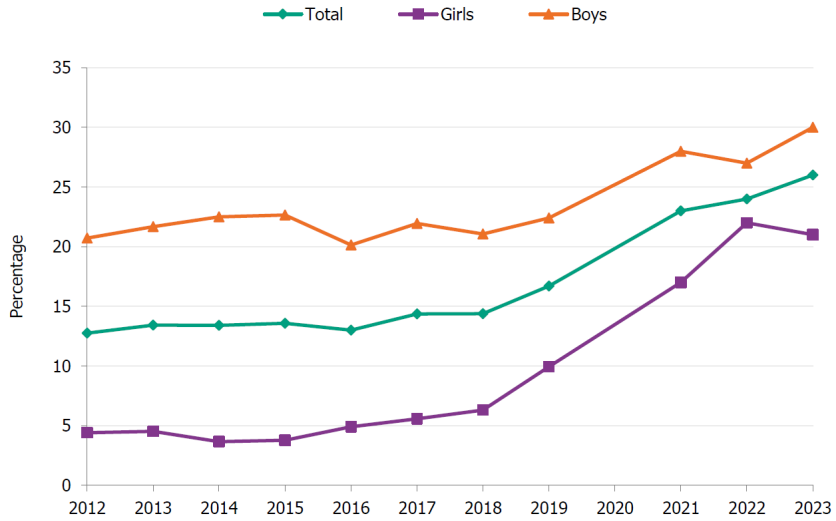
The proportion of pregnant women stating, at registration for maternity care, that they use snus was approximately 1 percent in 2021 and has remained relatively unchanged since the early 2000s (20).

Biggest increase in the use of snus is among young girls

Results of several surveys show that the use of snus among children and young people is on the increase, especially among girls. The proportion using snus on a daily basis long remained at 5 percent but has increased in recent years and in 2022 it was 12 percent among women in the 16-29 age group (18).

In 2018, 6 percent of girls in the second year of upper-secondary school reported using snus compared to 22 percent in 2022 (figure 2) (21). Among 15-year-olds, 27 percent of girls and 31 percent of boys had tried snus at some point in 2021/2022. This was an increase compared to four years earlier when the proportions were 7 and 20 percent respectively (23). The biggest increase was found among girls. Snus has also been tried by an increased proportion of 13-year-olds (23).

Figure 2. The proportion (percentage) of girls and boys in the second year of upper-secondary school who use snus (daily/almost daily or occasionally) in the period of 2012-2022, divided by gender.



Source: CAN's national school survey.

Many young people use nicotine pouches

More women than men in the 16-29 age group use nicotine pouches: 18 and 12 percent, respectively, in 2022 (18). In 2022, just over 20 percent of students in year 9 of the compulsory school and 40 percent in the second year of upper-secondary school reported having tried nicotine pouches at some point, of which roughly half had done it in the past month. This was an increase compared to the previous year. For a third of the girls and a quarter of the boys, nicotine pouches were the first tobacco and nicotine product that they had used.

Differences in the use of snus in the population

Considerably more men than women use snus. There are also differences in the use of snus between different social groups. The highest percentage can be found among people with upper-secondary education, compared to people with a compulsory school education and post-secondary education.

The use of e-cigarettes is increasing among children and young people

In 2022, 2 percent of the population aged 16-84 reported using e-cigarettes, of whom a quarter were using them daily. Use is approximately as common among women as it is among men (18).

Results of several surveys show that the use of e-cigarettes is on the increase among children and young people, and especially among girls. Among young women aged 16-29, an increase of 2 percent in 2021 to 8 percent in 2022 can be seen (18). Among men in the same age group, the percentage has increased from 2 to 5 percent.

Furthermore, an increase can be seen in the proportion of students in year 9 and in the second year of upper-secondary school that report having used e-cigarettes at some point, following a previous decrease during a couple of years. In year 9, 20 percent of students have used e-cigarettes in the last month, as have 24 percent of students in the second year of upper-secondary school (21). Among 13-year-olds, as well, many have tried e-cigarettes: 18 percent of girls and 15 percent of boys (23).

Combined use is common

In 2022, 19 percent of women and 31 percent of men reported using some type of tobacco or nicotine product, either every day or occasionally. It is common to use more than one product. For example, among individuals who smoke 18 percent of women and 34 percent of men also use snus (18). Among individuals using snus, 18 percent of women and 15 percent of men also smoke.

It is also common to combine the use of alcohol, cannabis and tobacco and nicotine products. Risky consumption of alcohol and cannabis is more common among individuals using tobacco and nicotine products than among those who do not use such products (24).

About the data sources

This chapter is based on surveys and registers that continuously collect self-reported data on the use of and exposure to tobacco and nicotine products in Sweden (18-25). We generally have a good picture of the use and development over time, although all products and all social groups are not equally well represented in national surveys.

Health risks associated with the use of tobacco and nicotine products

In this chapter we summarise health risks linked to the use of tobacco and nicotine products. We start by describing the health risks associated with each product. Following this, we describe cases of poisoning from tobacco and nicotine products.

Health risks associated with nicotine

All tobacco and nicotine products contain nicotine, which is acutely toxic and highly addictive. Nicotine dependence is characterised by continued use of products containing nicotine and withdrawal symptoms when quitting. The risk of nicotine dependence is affected, among other things, by the level of nicotine and how it is delivered.

A great deal of research on the effects of nicotine explores how nicotine affects underlying mechanisms in the body that may increase the risk of developing diseases. Nicotine stimulates receptors in many organs and tissues in the body and may for example affect the regulation of the nervous system and the cardiovascular system. This research is largely based on cell and animal studies.

Individuals who are exposed to nicotine run a short-term risk of being affected through impaired blood vessel functions as well as an increase in heart rate and blood pressure. In the long run, these cardiovascular effects may contribute to an increased risk of cardiovascular disease.

Nicotine during pregnancy may entail risks for the woman, the foetus and the newborn child.

There scientific evidence based on studies of humans is limited, mostly due to methodological limitations of the ability to isolate the effects of nicotine in tobacco and nicotine products. For more information on long-term health risks, we therefore refer to the sections on health risks associated with each individual product.

About the scientific evidence

The chapter on health risks and nicotine is based on one report from the US Health Department (26) and one from the Norwegian Institute of Public Health (27). We have not identified any systematic reviews published after these two reports (Appendix 1).

This research is largely based on cell and animal studies. Therefore, the knowledge from studies on humans as well as of the long-term health risks of nicotine, is limited.

Health risks associated with tobacco for smoking

There are different types of tobacco products for smoking, such as cigarettes, cigarillos, roll-your-own tobacco, cigars, pipe tobacco, heated tobacco products and water pipe tobacco. The smoke is harmful to health and may contain metals such as cadmium, lead and mercury but also many other harmful particles, substances and chemicals like cyanide, arsenic, aldehydes, polycyclic aromatic hydrocarbons and nitrosamines.

Respiratory disease

Tobacco smoking damages tissues and cells in airways and lungs and increases the risk of both acute respiratory problems and long-term problems such as coughing, excess mucus production and dyspnoea. Tobacco smoking is one of the major causes of COPD. Individuals with asthma who smoke are at risk of making their condition worse.

Cardiovascular disease and type 2 diabetes

Tobacco smoking has a negative effect on the cardiovascular system and increases the likelihood of developing hypertension or suffering a myocardial infarction or a stroke. Tobacco smoking also speeds up the development of atherosclerosis, which in turn increases the risk of developing cardiovascular disease. There is also an increased risk of type 2 diabetes, which is a known risk factor for cardiovascular disease.

Cancer

Tobacco smoking is the primary cause of lung cancer, and it also increases the likelihood of many other forms of cancers, such as cancer of the oesophagus, stomach, colon and rectum, bladder, kidneys and pancreas. Individuals who continue to smoke after they have been diagnosed with cancer are at higher risk of premature death due to their cancer, but also due to other causes, in comparison with those who do not smoke. Quitting smoking improves the prognosis for individuals with cancer.

Mortality

Tobacco smoking increases the likelihood of premature death, regardless of the cause, compared to individuals who do not smoke.

Risks during pregnancy and for the newborn child

Tobacco smoking during pregnancy increases the likelihood of miscarriage, ectopic pregnancy and stillbirth. Furthermore, there is an increased risk of complications for the newborn child, such as certain congenital malformations (e.g., cleft palate), impaired lung function and low birth weight. There is also an increased risk of sudden infant death syndrome during the first year of age.

Passive tobacco smoking indoors

Individuals who do not smoke but who are exposed to tobacco smoke indoors are at higher risk of coronary disease (for example myocardial infarction) and lung cancer compared to individuals who are not exposed to such passive smoking. Children are especially vulnerable, and research has demonstrated an increased risk of respiratory problems and impaired lung function and asthma in children who are exposed to tobacco smoke in their environment during childhood.

About the scientific evidence

This section is based on a report from the US Health Department on health risks associated with tobacco smoking, published in 2014 (26). Systematic reviews that were published more recently are in line with the results of this report (Appendix 1).

Research on tobacco smoking has been conducted during a long period of time and in many countries and the knowledge about health risks is therefore good. The scientific evidence is largely based on studies about cigarettes.

Health risks associated with snus (moist tobacco)

There are different types of snus with different content. Apart from nicotine, tobacco snus may contain metals and other harmful substances and chemicals such as volatile organic compounds, polycyclic aromatic hydrocarbons and nitrosamines. Nicotine pouches often contain plant fibres with added nicotine and different flavours (28). The nicotine level in both tobacco snus and nicotine pouches may vary between different products.

Since the content of snus varies between different countries, we choose to focus on health risks associated with snus used in Sweden. The information is based on what is known about tobacco snus, since there is yet a lack of knowledge regarding the health risks of nicotine pouches.

Cardiovascular disease

Using snus may affect the cardiovascular system by increasing the blood pressure and reducing the ability of the blood vessels to widen. However, it has not been established if there is a connection between using snus and suffering a myocardial infarction or stroke. On the other hand, individuals who use snus are at higher risk of dying within the first 24 hours after a myocardial infarction, compared to individuals who do not use snus. They also appear to be at higher risk of dying following a stroke, at a follow-up time of on average 17 years.

Type 2 diabetes

Type 2 diabetes is a known risk factor for cardiovascular disease, and individuals who use snus may be at higher risk of developing type 2 diabetes compared with

those who do not use snus. This increased risk can primarily be observed when the consumption exceeds four standard snus boxes per week.

Cancer

The association between using snus and cancer is not entirely unambiguous. Some studies indicate an increased risk of specific forms of cancer, such as rectal cancer. No increased risk has been observed for other forms of cancer, or the scientific evidence is too uncertain for a conclusion to be drawn about a possible association. However, individuals who use snus appear to be at higher risk of dying following a cancer diagnosis in comparison with individuals who do not use snus. This applies both to cancer-specific mortality and mortality from other causes.

Risks during pregnancy and for the newborn child

Using snus during pregnancy may increase the risk of complications such as premature birth or foetal death. Using snus during pregnancy may also lead to problems with the newborn child's breathing regulation.

Non-malignant changes in the oral cavity

Using snus may increase the risk of changes in the mucosa of the tongue as well as gum injuries where the snus has been placed.

About the scientific evidence

This section is based on a systematic review of the health risks associated with tobacco snus by the Norwegian Institute of Public Health (27). The review included studies from the Nordic countries published up until March 2018. We have not identified any systematic reviews published after the review by the Norwegian Institute of Public Health (Appendix 1).

Generally, the studies on snus only include males, and as a result there is a certain lack of knowledge about how the use of snus affects women's health, for example in terms of cancer and cardiovascular disease.

Health risks associated with e-cigarettes

The content of e-cigarette liquids can differ and apart from nicotine in varying concentrations the liquid may contain solvents, preservatives and various flavouring agents. Several substances that are harmful to health have been found in the liquids and the vapour, such as aluminium, lead and other metals, but also harmful particles, substances and chemicals such as aldehyde, polycyclic aromatic hydrocarbons and nitrosamines.

Short-term effects

Most studies on health risks associated with e-cigarettes that have been published so far have examined short-term effects. Among other things, the research focuses on the e-cigarettes' toxicity and effects on underlying mechanisms in the body that may increase the risk of diseases. For example, studies show that the use of e-cigarettes may cause arrhythmia, impair blood vessel function and temporarily increase blood pressure and heart rate. In the long run, this may contribute to an increased risk of cardiovascular disease. Studies also indicate that the use of e-cigarettes may irritate the airways and aggravate asthma symptoms.

Long-term health risks

Research on the long-term health risks of e-cigarettes is still very limited. The reason for this is that the products have not been in use very long and several years of research are needed to investigate long-tern effects. Hence, we still do not know whether e-cigarettes may increase the risk of cancer, cardiovascular disease and pulmonary disease. Also, there is still insufficient scientific evidence on the association between the use of e-cigarettes during pregnancy and possible complications for the woman, the foetus and the newborn child. Nor has the impact on the health of individuals who are exposed to the vapour from e-cigarettes been established.

About the scientific evidence

This section is based on a compilation of 90 systematic reviews on health risks associated with e-cigarettes published up until November 2021 (29). Systematic literature reviews published more recently agree with the results from this report (Appendix 1).

E-cigarettes are available in many different types and forms, and the contents of the e-cigarette liquid may differ between products. This makes it more difficult to draw any general conclusions about health risks.

Tobacco and nicotine product poisoning

Tobacco and nicotine products may cause poisoning. Assessment of the risk of poisoning due to an intake of or exposure to tobacco and nicotine products mostly depends, on the type of product, its route of administration and its nicotine level.

Poisoning incidents

In 2021, the Swedish Poisons Information Centre received 1,480 enquiries regarding tobacco and nicotine products. Most of those calls concerned snus. Calls about poisoning incidents connected to the consumption of snus have increased over the last decade, and consumption of snus is one of the most common reasons for calls that involve children (30).

Risks of acute poisoning

The nicotine in *snus* is absorbed from the oral and gastric mucosa. Consuming snus may cause symptoms such as vomiting, cold sweats, lethargy and heart palpitations (30).

The nicotine in *e-cigarette liquid* is absorbed through the oral and gastric mucosa. Absorption of e-cigarette liquid containing nicotine may quickly cause symptoms in the form of vomiting, cold sweats, lethargy and heart palpitations. In serious cases, cramps and altered heart rate, blood pressure and breathing may also occur. There have also been cases of deaths. Direct contact with the e-cigarette liquid may cause damage to eyes and skin. The nicotine may also be absorbed through the skin (30).

If *tobacco for smoking*, such as cigarettes, is consumed, this does not necessarily lead to poisoning as the nicotine is not absorbed to such a large extent. The most common symptoms in children are nausea and vomiting (30).

Use of a *water pipe* may cause carbon monoxide poisoning. Symptoms include nausea, headache, vomiting and in serious cases, unconsciousness. In addition to the acute risk of carbon monoxide inhalation there is also a risk of neurological damage (30).

Associations between e-cigarettes, snus and tobacco smoking

In this chapter, we describe possible associations between the use of e-cigarettes or snus and the use of smoking tobacco. Research on e-cigarettes comes from different parts of the world, while studies on snus are limited to Nordic countries.

Associations between e-cigarettes and tobacco smoking in non-smoking individuals

Over time, people who use e-cigarettes more frequently start smoking tobacco than people who do not use e-cigarettes. The quality of evidence is moderate, which means that it is likely that there is an association. The association is stronger for individuals under the age of 18, but it is possible that it also exists among adults. It is also likely that among individuals who use e-cigarettes, more will eventually develop a current use of smoking tobacco compared to individuals who do not use e-cigarettes.

Associations between snus and tobacco smoking in non-smoking individuals

Over time, people who use snus more frequently start smoking tobacco than people who do not use snus. The quality of evidence is low, which means that it is possible that there is an association. There are not enough studies to draw any conclusions on whether there is an association between the use of snus and a current use of smoking tobacco.

Change in smoking habits in individuals who already smoke

For individuals who smoke tobacco and who have also started to use snus or e-cigarettes, it is not possible to draw any conclusions on whether there is an association with changed smoking habits. This applies to any type of change, both increased or reduced smoking of tobacco or quitting smoking altogether. In terms of e-cigarettes, this is due to inconsistent study results. Regarding snus, there are not enough studies to determine whether there is an association or not.

About the scientific evidence

This chapter is based on a systematic review by the SBU (17). The review includes studies published up until November 2019. It is not possible to determine whether the associations that have been found are causal or if the behaviours are connected due to shared underlying factors. Systematic reviews concerning the association between e-cigarettes and tobacco smoking published after 2019 are in line with the results from the SBU (Appendix 1). We have not identified any more recent systematic reviews about snus and tobacco smoking.

Diseases and the use of tobacco and nicotine

In this chapter, we describe the incidence and prevalence of some diseases in Sweden for which there is an association between the f tobacco and nicotine use and increased risk of disease. These are diseases that affect the global health status of the population. These diseases are unequally distributed across the Swedish population. The information is primarily based on the National Board of Health and Welfare's national data sources (Appendix 2).

Cardiovascular disease and type 2 diabetes

Tobacco smoking increases the risk of developing myocardial infarction, stroke and hypertension. Smoking also increases the risk of type 2 diabetes, which is a known risk factor for cardiovascular disease. Using snus may also affect the cardiovascular system by an acute increase in blood pressure and by reducing the ability of the blood vessels to widen. Using snus may also result in increased mortality following a myocardial infarction or stroke. The use of e-cigarettes may lead to increased blood pressure and heart rate as well as impaired blood vessel function.

In 2021, 298 per 100,000 inhabitants suffered a myocardial infarction and 59 per 100,000 inhabitants died from it. It is more common for men to suffer a myocardial infarction than it is for women, and men generally have a higher mortality rate. Individuals with no more than a compulsory school education also show higher mortality rates after a myocardial infarction than those with higher levels of education.

In 2021, 338 per 100,000 inhabitants suffered a stroke. Approximately 5,900 people died from a stroke. Stroke is more common among men than among women and among people with no more than a compulsory school education (31).

The number of patients with hypertension who were treated in hospital and specialised outpatient care in 2021 was 283 per 100,000 inhabitants.

In the same year, 383 per 100,000 inhabitants were treated for type 2 diabetes in hospital and specialised outpatient care.

Lung cancer

Tobacco smoking is the principal cause of lung cancer. In 2021, 45 women and 35 men per 100,000 inhabitants were diagnosed with lung cancer. The number of women diagnosed has increased since the 1970s but dropped somewhat in 2019-2021. The number of men diagnosed has decreased somewhat since the mid-1970s. Lung cancer was the type of cancer causing the highest number of deaths among women in 2021. Lung cancer is more common among people with a compulsory

school education than among those who have an upper-secondary or post-secondary education.

Chronic obstructive pulmonary disease (COPD)

Tobacco smoking is one of the principal causes of COPD. In 2021, 169 patients with COPD were treated in hospital and specialised outpatient care per 100,000 inhabitants. The number of deaths was 23 per 100,000 inhabitants. The number of deaths has decreased since around 2017.

Premature death

Tobacco smoking increases the risk of premature death, irrespective of cause. In 2021, 9,974 individuals died prematurely (deaths between the ages of 15 and 64 are defined as premature). Such deaths are more common among men than among women, and among people with a compulsory school or an upper-secondary education compared with those with a post-secondary education (32).

Current estimates are lacking

There are no current estimates of how many people fall ill and die as a result of tobacco and nicotine use in Sweden. In 2014, the National Board of Health and Welfare published a report on the number of people estimated to fall ill and die annually as a result of tobacco smoking based on the period 2010-2012 (33), but this report needs to be updated.

Social costs of tobacco and nicotine use

The social costs of smoking-related morbidity in Sweden were estimated at SEK 31.5 billion in 2015, according to a report by the Swedish Institute for Health Economics (IHE) (34). The biggest cost item was lost market output, estimated at SEK 16.3 billion, or 52 percent of the total cost. Healthcare costs were estimated at SEK 9.9 billion (32 percent), lost domestic work at SEK 3.3 billion (10 percent), and costs of informal care at SEK 2.0 billion (6 percent). The three smoking related diseases generating the highest total costs resulting from smoking were lung cancer, ischemic heart disease and COPD.

Limited knowledge about costs

There are no health-economic estimates regarding the use of other tobacco and nicotine products in Sweden. Likewise, there are limitations to the estimates of the costs of smoking related morbidity, e.g., due to incomplete data about various levels of care, about the cost of drugs, and about lost domestic work due to illness. For example, IHE discusses the lack of national primary care data, something that the National Board of Health and Welfare also highlights in its reports within the framework of this commission and other Government commissions (20; Appendix 2).

Overall picture of harmful effects

In this section we provide an overall picture of the harmful effects of the products, current state of knowledge and our conclusions. Tobacco and nicotine products may cause harmful effects in different ways. Their use may entail health risks and affect public health through an increased burden of disease and mortality rate and may also increase social costs. The extent of the harmful effects is affected by matters such as how the product is used and how this use develops.

Table 2 summarises the use and health risks of tobacco and nicotine products, in relation to each other.

Table 2. Summary of the use and health risks of tobacco and nicotine products

Area	**Smoking tobacco**	**Snus (moist tobacco)**	**Nicotine pouches**	**E-cigarettes**
Development of use	Decreasing	Increasing	Increasing among young people	Increasing among young people
Association with tobacco smoking	-	Yes	Lack of scientific evidence	Yes
Addictive	Yes	Yes	Yes	Yes
Cardiovascular disease	Increased risk of most cardiovascular diseases	Increased risk of hypertension	Lack of scientific evidence	Impact on heart rhythm, blood pressure and blood vessels
Cancer	Increased risk of several forms of cancer	Increased risk of some forms of cancer	Lack of scientific evidence	Lack of scientific evidence
Type 2 diabetes	Increased risk	Increased risk	Lack of scientific evidence	Lack of scientific evidence
Pulmonary diseases	Increased risk of pulmonary diseases	Lack of scientific evidence	Lack of scientific evidence	Aggravates asthma
Risks during pregnancy	Increased risk of miscarriage, stillbirth, low birth weight and sudden infant death syndrome	Increased risk of stillbirth, premature birth and problems with the breathing regulation of new-borns	Lack of scientific evidence	Lack of scientific evidence
Mortality	Increased risk of premature death	Increased risk of death following a stroke, myocardial infarction and certain cancer diagnoses	Lack of scientific evidence	Lack of scientific evidence

Use and development

Tobacco smoking has long been on the decrease in the population, while the use of snus has increased in recent years after having remained relatively stable for a long

period. Use of e-cigarettes and nicotine pouches is increasing among young people. At the same time, many young people still use smoking tobacco. Individuals who use snus or e-cigarettes, are also more likely to initiate tobacco smoking.

Health risks

Common to all tobacco and nicotine products is that they contain nicotine, which is acutely toxic and highly addictive. In the short term, nicotine can impair blood vessel functions, raise blood pressure and increase the heart rate – which may in the longer term contribute to an increased risk of cardiovascular disease. Nicotine during pregnancy may carry risks for both the woman and the child. Products containing nicotine may also cause poisoning.

Tobacco smoking increases the risk of several cancers, cardiovascular diseases, type 2 diabetes and pulmonary diseases. There is also an increased risk of premature death. Smoking during pregnancy increases the risk of several complications for both the woman and the child.

Use of tobacco snus may increase the risk of temporary hypertension, type 2 diabetes and certain forms of cancer. The use of tobacco snus may also contribute to an increased risk of death following a myocardial infarction, stroke and certain cancer diagnoses. As with smoking, using snus during pregnancy entails risks to the woman and the child. There is a lack of scientific evidence on the health risks associated with using nicotine pouches.

Similarly to the health risks associated with nicotine, using e-cigarettes may cause arrhythmia, impair blood vessel function and increase heart rate and blood pressure, thus contributing to an increased risk of cardiovascular disease. Use of e-cigarettes may also irritate the airways and aggravate problems with asthma. There is a lack of scientific evidence concerning long-term use of e-cigarettes.

The scientific evidence about health risks varies

The level of scientific evidence about the health risks associated with different types of tobacco and nicotine products varies, e.g., depending on how long a type of product has been on the market, how many people are using it and how much research has been carried out.

Tobacco for smoking has long been in use and extensive research has been carried out over many years. Because of this, there is strong scientific evidence that tobacco smoking increases the risk of several diseases. For other types of products, the scientific evidence is more limited. E-cigarettes have been used during a relatively short period of time and there is therefore a lack of scientific evidence regarding several possible health risks, in particular long-term ones. The scientific evidence is also more limited regarding products that are not widespread globally, such as snus.

However, a lack of studies, or that the available research is too uncertain to determine whether there is an association or not, , does not mean that certain risks can be ruled out . All tobacco and nicotine products may lead to addiction and entail health risks, although tobacco smoking is associated with particularly great risks.

Limited knowledge about harmful effects on society

There are no current estimates of how many people fall ill and die as a result of tobacco and nicotine use in Sweden. The estimates that are available are based on data on tobacco smoking from 2010 to 2012 (33) and need to be updated. There are no estimates for other types of tobacco and nicotine use in Sweden. Furthermore, there is no consolidated and comprehensive picture of the use of societal resources related to tobacco and nicotine use, where healthcare resources represent a considerable portion. For example, we do not have national register data on primary health care interventions in cases of tobacco and nicotine use.

Children and young people are especially vulnerable

Children and young people are especially vulnerable. Addiction often develops at a young age and young people who use e-cigarettes or snus may also eventually start smoking. Children are also a particularly vulnerable group in terms of nicotine poisoning. The use of newer nicotine products such as nicotine pouches and e-cigarettes is most common among young people and the use is increasing. Many girls use nicotine pouches, a group that previously did not use snus to any great extent. At the same time, many young people continue to use smoking tobacco.

Impact on equity in health

The objective of the Swedish public health policy is to create social conditions for good and equitable health throughout the population. Today there are large differences in tobacco and nicotine use in terms of gender and education, and these differences contribute to health inequalities. For example, lung cancer and cardiovascular disease are more common among individuals with less education.

We should use existing knowledge as a starting point

Our compilation shows that it takes time to build up scientific evidence about health risks associated with tobacco and nicotine products, both because research itself takes time and because it may take a long time for diseases to develop after a potentially harmful exposure. Although there is a lack of scientific evidence about some types of products, we must apply what we already know about the harmful substances included in these products. For example, knowledge of the health risks associated with nicotine can be used to assess the risks of nicotine pouches. We should also take into account how the use is changing. The increase in the use of snus and e-cigarettes among young people shows that these products attract groups that we seek to protect through health promoting and preventative work.

Important to protect children and young people through equivalent regulation

One of the main reasons for the decrease of tobacco smoking in Sweden is the long-term tobacco-preventative work carried out in collaboration between multiple actors. Several measures within tobacco policy intended to decrease the use of these products, have also been implemented. At present, the regulation is different for different types of products, e.g., in terms of ban on marketing, prohibition of flavouring and regulation of nicotine levels (Table 1). A regulation of tobacco and nicotine products that is more similar to the protective legislation that exists for tobacco smoking would reduce the accessibility and demand in a way that would contribute to better protection of children and young people.

Appendices

Appendix 1: Supplementary mapping of systematic literature reviews

Appendix 2: Care associated with tobacco and nicotine use and the prevalence of tobacco and nicotine related diagnoses and diseases. The appendix has been produced by the National Board of Health and Welfare and can be read here: https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/ovrigt/2023-6-8658.pdf

Website of the National Board of Health and Welfare, with scientific evidence, advice and regulations on alcohol, narcotics, doping, tobacco and gambling

ANDTS - alcohol, narcotics, doping, tobacco and gambling - the National Board of Health and Welfare

References

1. The Swedish Commission for Equity in Health. It is about equity in health. Starting points for how the Commission wants to proceed with its work. Interim report (SOU 2016:55) [Internet]. Stockholm: Wolters Kluwer; 2016 [cited 20 June 2023]. Downloaded from: https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2016/08/sou-201655/.
2. Government bill 2017/18:249. Good and equitable health: a developed public health policy Stockholm: The Ministry of Health and Social Affairs, 2018 [cited 20 June 2023]. Downloaded from: https://www.regeringen.se/rattsliga-dokument/proposition/2018/04/prop.-201718249.
3. The Swedish Commission for Equity in Health. Nästa steg på vägen mot en mer jämlik hälsa: förslag för ett långsiktigt arbete för en god och jämlik hälsa: slutbetänkande (SOU 2017:47) [Internet]. Stockholm: Wolters Kluwer; 2017 [cited 20 June 2023]. Downloaded from: https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2017/06/sou-201747/.
4. World Health Organization (WHO). Noncommunicable diseases: key facts [Internet]. Geneva: WHO; 2022 [updated 16 September 2022; cited 20 June 2023].
5. Institute for Health Metrics and Evaluation (IHME). GBD 2019. GBD Compare VizHub [Internet]. Seattle, WA: IHME, University of Washington; 2023 [cited 20 June 2023]. Downloaded from: https://vizhub.healthdata.org/gbd-compare/.
6. Dahlgren G, Whitehead M. Policies and Strategies to Promote Social Equity in Health [Internet]. Stockholm: Institute for Future Studies; 2007. Work report 2007 No. 14 [cited 20 June 2023] Downloaded from: https://www.iffs.se/publikationer/arbetsrapporter/policies-and-strategies-to-promote-social-equity-in-health/.
7. U.S. National Cancer Institute and World Health Organization. The Economics of Tobacco and Tobacco Control. National Cancer Institute Tobacco Control Monograph 21. NIH Publication No. 16-CA-8029A. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute; and Geneva, CH: World Health Organization; 2016.
8. The Public Health Agency of Sweden. Utblick folkhälsa: Smaksatta e-cigaretter tilltalar unga [Internet]. Stockholm: The Public Health Agency of Sweden; 2020 [cited 20 June 2023]. Downloaded from: https://www.folkhalsomyndigheten.se/contentassets/878fb033a6ba4f0994989089437375d7/smaksatta-e-cigaretter-tilltalar-unga.pdf.
9. The Public Health Agency of Sweden. Hur ser ungdomar på snus? – Erfarenheter och insikter från ungdomar om snus och snusanvändning [Internet]. Stockholm: The Public Health Agency of Sweden; 2022 [cited: 20 June 2023]. Downloaded from: https://www.folkhalsomyndigheten.se/publikationer-och-material/publikationsarkiv/h/hur-ser-ungdomar-pa-snus-erfarenheter-och-insikter-fran-ungdomar-om-snus-och-snusanvandning/.
10. Act (2018:2088) on tobacco and similar products [Internet]. Stockholm: Ministry of Health and Social Affairs [cited 20 June 2023]. Downloaded from: https://www.riksdagen.se/sv/dokument-och-lagar/dokument/svensk-forfattningssamling/lag-20182088-om-tobak-och-liknande-produkter_sfs-2018-2088/.
11. Act (2022:1257) on tobacco and similar products [Internet]. Stockholm: Ministry of Health and Social Affairs [cited 20 June 2023]. Downloaded from: https://www.riksdagen.se/sv/dokument-och-lagar/dokument/svensk-forfattningssamling/lag-20221257-om-tobak-och-liknande-produkter_sfs-2022-1257/.
12. World Health Organization (WHO). WHO Framework Convention on Tobacco Control. [[Internet]. Geneva: WHO; 2003 [updated 2004, 2005; cited 20 June 2023]. Downloaded from: https://www.who.int/fctc/en/.

13. Government bill 2015/16:82. Actions for increased public health in the tobacco area - implementation of the EU's tobacco products directive. Stockholm: The Government [cited 20 June 2023]. Downloaded from: https://regeringen.se/rattsliga-dokument/proposition/2016/02/prop.-20151682/.

14. The Swedish Government Offices. Agenda 2030 for sustainable development [Internet]. Stockholm: The Swedish Government Offices [cited 20 June 2023]. Downloaded from: https://www.regeringen.se/regeringens-politik/globala-malen-och-agenda-2030/.

15. Government bill S2018.010. Convention on the Rights of the Child (Swedish). Stockholm: The Government [cited 20 June 2023]. Downloaded from: https://www.regeringen.se/rapporter/2018/06/konventionen-om-barnets-rattigheter-s2018.010/.

16. Government bill 2021/22:213. Overall coordination and monitoring of a policy for alcohol, narcotics, doping, tobacco and gambling 2022-2025. Stockholm: The Government [cited 20 June 2023]. Downloaded from: Overall coordination and monitoring of a policy for alcohol, narcotics, doping, tobacco and gambling 2022-2025 - Regeringen.se.

17. Swedish Agency for Health Technology Assessment and Assessment of Social Services. Samband mellan snus, e-cigaretter och tobaksrökning: en systematisk översikt [Internet]. Stockholm: Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU); 2020. SBU Bereder 312 [cited 20 June 2023]. Downloaded from: https://www.sbu.se/312.

18. The Public Health Agency of Sweden. Nationella folkhälsoenkäten – Hälsa på lika villkor [Internet]. Stockholm: The Public Health Agency of Sweden; 2023 [updated 1 March 2023; cited 20 June 2023]. Downloaded from: https://www.folkhalsomyndigheten.se/folkhalsorapportering-statistik/om-vara-datainsamlingar/nationella-folkhalsoenkaten/.

19. Statistics Sweden SCB. Surveys of living conditions (ULF) [Internet]. Stockholm: SCB; 2023 [cited 20 June 2023]. Downloaded from: https://www.scb.se/hitta-statistik/statistik-efter-amne/levnadsforhallanden/levnadsforhallanden/undersokningarna-av-levnadsforhallanden-ulf-silc/.

20. The National Board of Health and Welfare Lägesbild 2023 – Uppföljning av ANDTS-strategins mål avseende vård och omsorg [Internet]. Stockholm: The National Board of Health and Welfare; 2023 [cited 20 June 2023]. Downloaded from: https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/ovrigt/2023-3-8466.pdf.

21. The Swedish Council for Information on Alcohol and Other Drugs (CAN). CAN's national school survey [Internet]. Stockholm: CAN; 2022 [updated 12 December 2022; cited 20 June 2023]. Downloaded from: https://www.can.se/undersokningar/cans-nationella-skolundersokning/.

22. The Public Health Agency of Sweden. Utvecklingen i förhållande till ANDT-strategins mål [Internet]. Stockholm: The Public Health Agency of Sweden; 2020 [cited 20 June 2023]. Downloaded from: https://www.folkhalsomyndigheten.se/publicerat-material/publikationsarkiv/u/utvecklingen-i-forhallande-till-andt-strategins-mal/.

23. The Public Health Agency of Sweden. Skolbarns hälsovanor [Internet]. Stockholm: The Public Health Agency of Sweden; 2023 [updated 16 May 2023; cited 20 June 2023]. Downloaded from: https://www.folkhalsomyndigheten.se/folkhalsorapportering-statistik/tolkad-rapportering/skolbarns-halsovanor/.

24. The Public Health Agency of Sweden. Kombinerat bruk av ANTS [Internet]. Stockholm: The Public Health Agency of Sweden; 2022 [updated 16 November 2022; cited 20 June 2023]. Downloaded from: https://www.folkhalsomyndigheten.se/livsvillkor-levnadsvanor/andts/utveckling-inom-andts-anvandning-och-ohalsa/anvandning/kombinerat-bruk-av-ants/.

25. The Public Health Agency of Sweden. Användning av tobaks- och nikotinprodukter [Internet]. Stockholm: The Public Health Agency of Sweden; 2021 [updated 22 November 2021; cited 20 June 2023]. Downloaded from: https://www.folkhalsomyndigheten.se/livsvillkor-levnadsvanor/andts/utveckling-inom-andts-anvandning-och-ohalsa/anvandning/anvandning-av-tobaks-och-nikotinprodukter/.

26. National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General [Internet]. Atlanta (GA): Centers for Disease Control and Prevention (US); 2014 [cited 20 June 2023]. Downloaded from: https://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/index.htm.

27. Norwegian Institute of Public Health. Helserisiko ved snusbruk [Internet]. Oslo: Norwegian Institute of Public Health; 2019 [cited 20 June 2023]. Downloaded from: https://www.fhi.no/en/publ/2019/health-risks-from-snus-use2/.

28. Stricter policies on new nicotine products (Bill 2021/22:200). Stockholm: Ministry of Health and Social Affairs; 2022 [cited 20 June 2023]. Downloaded from: https://www.riksdagen.se/sv/dokument-och-lagar/dokument/proposition/prop-2021-22-200_h90322200/

29. Asfar T, Jebai R, Li W, Oluwole OJ, Ferdous T, Gautam P, et al. Risk and safety profile of electronic nicotine delivery systems (ENDS): an umbrella review to inform ENDS health communication strategies. Tob Control. 2022;0:1-10. DOI:10.1136/tc-2022-057495.

30. Swedish Poisons Information Centre, a unit within the Medical Products Agency. Solna, Swedish Poisons Information Centre; 2023. Cases of poisoning caused by tobacco and nicotine products. Downloaded from: https://giftinformation.se/aktuellt/forgiftningsfall-orsakade-av-tobaks--och-nikotinprodukter/

31. The Public Health Agency of Sweden. Public health data: Stroke, insjuknande efter utbildningsnivå, kön och år [Internet]. Stockholm: The Public Health Agency of Sweden; 2023 [cited 20 June 2023]. Downloaded from: http://fohm-app.folkhalsomyndigheten.se/Folkhalsodata/pxweb/sv/A_Folkhalsodata/A_Folkhalsodata__A_Mo8__Halsoutfall__03Cirkorg__03.03Stroke/StrokeUtb.px/.

32. The Public Health Agency of Sweden. Hälsa – Resultat för uppföljningen av övergripande indikatorer på hälsa [Internet]. Stockholm: The Public Health Agency of Sweden; 2023 [cited 20 June 2023]. Downloaded from: https://www.folkhalsomyndigheten.se/publikationer-och-material/publikationsarkiv/h/halsa/?pub=120975.

33. The National Board of Health and Welfare. Registry data on the harmful effects of tobacco smoking [Internet]. Stockholm: The National Board of Health and Welfare; 2014 [cited 20 June 2023]. Downloaded from: https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/statistik/2014-3-4.pdf.

34. Andersson E, Toresson GE, Norrlid H, Fridhammar A. Samhällskostnaden för rökningsrelaterad sjuklighet i Sverige 2017. IHE: The Swedish Institute for Health Economics, 2017. IHE Rapport 2017:4.

The Public Health Agency of Sweden is an expert authority with responsibility for public health issues at a national level. The Agency develops and supports activities to promote health, prevent illness and improve preparedness for health threats. Our vision statement: a public health that strengthens the positive development of society.

Folkhälsomyndigheten
PUBLIC HEALTH AGENCY OF SWEDEN

Solna Nobels väg 18, 171 82 Solna. **Östersund** Campusvägen 20. Box 505, 831 26 Östersund.

www.folkhalsomyndigheten.se