Socialstyrelsen

Prerequisites for a national model for risk assessment in dentistry

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Preface

The National Board of Health and Welfare has, on behalf of the government, assessed the conditions for the introduction of a national model for risk assessment in dental care. The scientific basis has been included in the assessment.

Based on the assessment, the authority also submits proposals on how a model can be developed, as well as a number of aspects that are important to take into account if and when a national model for risk assessment is developed. The authority also submits a proposal for a plan for continued work.

The National Board of Health and Welfare extends a warm thank you to everyone who participated in the reference group and dialogues and gave their views during the course of the work. Your contributions have been very valuable!

The National Board of Health and Welfare extends special thanks to the State's preparation for medical and social evaluation, the Dental and Pharmaceutical Benefits Agency and the Swedish Social Insurance Agency, as well as to the odontological experts who were connected to the work - Per Alstergren, Carl-Otto Brahm, Lars Gahnberg, Björn Klinge, Peter Lingström and Nina Sabel - as well as health economists Thomas Davidson and Victor Abdalla.

The report has been prepared by project managers Clara Lindberg and Anna Bredin, together with a project group consisting of Rasmus Sjögren, Keng Ling Wallin, Daniel Trankell, Therese Lithner, Bengt Ståhl, Sanna Hiort and Emma Kindlund. Peter Lundholm and Álfheiður Ástvaldsdóttir

have been odontological experts. The project group has had a steering group at the authority at its disposal, and medical advisor Elisabeth Wärnberg Gerdin has been the project owner. Responsible department head has been Natalia Borg.

Olivia Wigzell
Director General

Content

Summary

This is a final report of the government's mission to assess the conditions for the introduction of a national model for risk assessment in dental care. The National Board of Health and Welfare has assessed the conditions both for develop and to introduce and use such a model. During the work with government assignment, the National Board of Health and Welfare has cooperated and conducted dialogue with a large number of actors.

Good conditions, but further investigation is needed

The National Board of Health and Welfare assesses that, from an operational perspective, there are good conditions for introducing a national model for risk assessment in dental care in Sweden. Depending on how the model is designed, further investigation needs to be done. It concerns, among other things, the legal prerequisites for healthcare providers to enter and document information that is not in current decision support, above all social factors, in a national risk assessment model. It is also about these care providers to an increased extent being able to collaborate and share information from other care providers in dental care, health care and social services in order to use in a risk assessment model. In order to create such conditions, it may be necessary to implement constitutional changes in existing regulations at the level of laws, regulations or regulations. Furthermore, it is necessary to take into account that the scientific basis for risk assessments in dental care is limited[1] . Among other things, this will require special methods to determine the best available knowledge.

A national model for risk assessment can contribute to more equal dental care by assessing all patients' risk of developing oral health problems according to the same criteria. A national model for risk assessment can thus strengthen dental care's ability to work more cause-oriented and preventively. At the same time, the patient's role in dental care can be strengthened, as the model can become a tool to make the patient more involved in the risk assessment, and in their own care.

[1] In its review of scientific studies, the State's preparation for medical and social evaluation, SBU, uses the term prediction models. In accordance with the SBU's definition, prediction models refer to methods that aim to identify patient-specific risk factors and that can predict the prognosis for the individual patient.

The knowledge base for a national model for risk assessment needs to be determined

There is a lack of scientific evidence for the effect of balanced risk assessment models in dental care. The best available knowledge can be produced partly through processes to establish proven experience, partly with the help of scientific evidence for the impact of individual factors on oral health and support in foreign guidelines for risk assessments and revision intervals. SBU has reviewed scientific studies that have evaluated prediction models for the individual disease conditions caries and periodontitis. The National Board of Health and Welfare's mapping has shown that all other Nordic countries work with risk assessment in dental care and use guidelines for risk assessments and revision intervals, i.e. the time between basic examinations.

In a search for foreign guidelines, we have among other things identified several Nordic guidelines for determining audit intervals. These guidelines in turn refer to a guideline for revision intervals produced in England (NICE) [1], which was also identified in the literature search. In the English guideline, dental practitioners receive support in the clinical work with risk assessment, in the form of a checklist with factors that influence how oral health develops. These factors are also included in the Danish and Norwegian guidelines on audit intervals and risk assessment, but have been adapted to the respective country's context. In this investigation, the National Board of Health and Welfare has not assessed the methodological and scientific quality of how these guidelines and checklists are produced. The methodological quality of these guidelines can be assessed to determine whether they can be indicative in a work to develop a risk assessment model in Sweden.

Decision support for risk assessments serves different purposes and varies in complexity

The National Board of Health and Welfare's mapping of risk assessments and decision support for risk assessments shows that many dentists and dental hygienists use some form of support for the individual risk assessments, for example decision support integrated into record systems, guidelines or routines. The decision aids fulfill several different purposes. The most common are determining revision intervals, assessing prognosis and communicating with the patient. All providers of journal systems on the market in Sweden offer some form of risk assessment module, structured in different ways. In several of these risk assessment modules, patients are grouped, in different ways, into risk groups according to a set scale. The survey also shows that dentists and dental hygienists take into account factors that can affect oral health as well
such as general health, even if the factors are not included in a decision support.

Dentists and dental hygienists from both public and private dental care feel that it is important that the practitioner has the opportunity to adjust the risk assessment and a possible proposal from a decision support. They also feel that current decision support lacks certain factors that are particularly important in risk assessments of children, above all social factors. They believe that a national model for risk assessment needs to be simple, but at the same time detailed enough to feel meaningful. A model should be able to be integrated into the medical record systems so as not to increase the administrative burden for the dental care staff.

A national model needs to be based on uniform terms and definitions

For a model to be nationally uniform, it needs to be based on uniform terms (expressions) and definitions, and adherence to these. It is important for the risk assessments to be documented and communicated. Uniform terms and definitions also create better opportunities both for evaluating the model and for research and knowledge development in dentistry. It is an advantage if the information specification for a national model for risk assessment is based on terminology in the international concept system Snomed CT.

This increases the chances that the model will work well together with existing systems and working methods in general within the health and medical care and with other actors, both nationally and internationally.

A standardized way of entering data into the model would also increase patient safety and trust, as the model is then based on national or international standards according to relevant laws and regulations.

Proposal for the design of the model

The National Board of Health and Welfare has summarized a number of aspects to take into account, and keep in mind, if and when a national model for risk assessment is to be designed. Some parts of the process of introducing a national risk assessment model will require further legal analysis and investigation. A model could be introduced gradually, for example for different age groups, but with the aim of covering all dental care patients in Sweden.

A model can be designed with varying degrees of complexity. A simple model can mean that the therapist is only reminded to pay attention to a number of factors during the risk assessment. A more advanced model could weight values against each other and calculate a weighted risk group.

Prerequisites for a national model for risk assessment in dentistry

• The purpose of the model needs to be clear and guide the design and complexity of the model.

• The model should be designed in collaboration with a wide range of actors and competences. Dental professionals should be involved in the entire process, from the development to the introduction of the model. • The model should enable risk assessment in the entire population.

Special consideration needs to be given to the special situation of children and individuals in need of special support when developing the model.

• The practitioner should be able to adjust the risk assessment manually.

• In order to minimize the risk of incorrect payments, financial compensation should not be linked to a risk assessment result. Such a compensation solution would also risk creating ethical stress for therapists.

• A national risk assessment model can be a tool to achieve more efficient resource management in dental care, but must then be supplemented with compensation systems that do not provide conflicting incentives.

• The patient should be involved in the risk assessment process, and the results of the risk assessment should be readily available to the patient.

• The model should be able to be integrated into the medical record systems, to reduce the administrative burden on the dental staff. A model that can automatically collect data from other parts of the record system provides the conditions for reduced administration and more support for clinical decision-making and therapy planning.

• In connection with the development of the model, a plan for evaluation, follow-up and development of the model should be drawn up.

• One way to evaluate and follow up the model on a national level could be to develop the dental health register. Such a change, however, requires both closer considerations and constitutional amendments and needs to be investigated in a special order.

• A national risk assessment model should also be evaluated based on the health outcome, i.e. how oral health is affected.

• The model should be managed in close collaboration with the users to make it possible to share experiences and make analyses.

• Educational efforts will be necessary, in order to ensure that the model is introduced and used in dental care.

The process of developing and implementing a national risk assessment model includes several steps. It is, for example, about

• determine the purpose and complexity of the model

• determine knowledge base

- produce an information specification for the model to establish uniform terms and definitions

An evaluation plan needs to be drawn up in parallel with the development of the model, and it needs to be determined which data and data flows are required for the evaluation. The process of developing and introducing the model probably needs to take place in different stages. For example, the model's content and design need to be clarified in order to determine the model's information specification, uniform terms and definitions. In the further development work, legal considerations will also be necessary.

The content of the assignment

The National Board of Health and Welfare has been tasked with assessing the conditions for the introduction of a national model for risk assessment in dental care[2]. The task includes assessing the scientific basis for a national model for risk assessment, analyzing and submitting proposals on how a national model for risk assessment can be designed, as well as presenting a plan for continued work on implementing the model.

The assignment must be carried out in dialogue with the State's preparation for medical and social evaluation, the Dental and Pharmaceutical Benefits Agency, the Swedish Social Insurance Agency, the regions and Sweden's municipalities and regions. Any proposals must be expedient and cost-effective, fit within existing financial frameworks and not entail increased costs for the general dental care allowance or for the state dental care support in general and designed so that the risks of incorrect payments are minimized.

The state's preparation for medical and social evaluation, SBU and the Dental and Pharmaceutical Benefits Agency, TLV have been tasked[3,4] by the government to support the National Board of Health and Welfare in the current task.

In order to carry out the task *of assessing the conditions for the introduction of a national model for risk assessment in dental care,* the National Board of Health and Welfare has identified areas that were relevant to map and analyze. The National Board of Health and Welfare has both assessed the conditions for developing and introducing a model. The prerequisites for *developing* a model is about the inherent, scientific prerequisites for assessing the risk of ill health in the mouth and being able to communicate and document these. The prerequisites for *introducing* the model are about the surrounding the conditions for introducing such a risk assessment model in the Swedish dental care system.

The National Board of Health and Welfare has assessed the scientific basis for risk assessment models in collaboration with SBU, as well as identified guidelines for risk assessments in dental care. The design, and content, of a model depends on the scientific basis for a model. Due to the limited scientific basis for risk assessment models, which are examined and presented in the report, it is not possible to present a complete

suggestions on how a model can be designed within the time frame for this assignment. Therefore, no cost calculations are reported either. However, the National Board of Health and Welfare highlights aspects to consider when designing a model. Further

[2] S2023/01524 Government. Assignment to assess the conditions for the introduction of a national model for risk assessment in dentistry.

[3] S2023/01926 Government. Assignment to support the work of assessing the conditions for a introduction of a national model for risk assessment in dentistry, SBU.

[4] S2023/01927 Government. Assignment to support the work of assessing the conditions for a introduction of a national model for risk assessment in dental care, TLV.

a plan for continued work is presented, as well as aspects to consider when implementing a model.

In order to make a balanced assessment of the conditions for the introduction of a national model for risk assessment in dental care, the National Board of Health and Welfare has also mapped today's risk assessments and decision support for risk assessment. The mapping includes how current decision support used and perceived by treating staff, risk assessments for different patient groups and the existence of risk assessments in the Nordic region.
However, the mapping has not included any evaluation of work in progress. The combined assessment also takes into account information structure and health informatics, data flows, legal aspects and health economic aspects.

Outline of the report

The report begins with a background section that describes relevant definitions and terms, other investigations that were essential for the assignment, today's dental care system and what role risk assessments have in dental care today, followed by a description of method and implementation.
The mapping of risk assessments and decision support for risk assessment is then reported. It also includes, among other things, a Nordic environmental analysis as well as an analysis of possible risk groupings based on historical care consumption data.

After that, we describe the conditions for developing and introducing a national model for risk assessment. The description begins with the assessment of the scientific basis as well as information structure and health informatics.
This is followed by other prerequisites: data flows, legal aspects and health economic aspects.

The authority reports a number of aspects that should be taken into account in the design of a national model for risk assessment in dental care.
In conclusion, we summarize the authority's assessment and present a plan for continued work.

Background

Caries and periodontitis are the most common oral diseases and among the most common non-communicable diseases in the world. Illness in the mouth leads to a reduced quality of life and great costs for both individuals and society. The World Health Organization, WHO reports that the burden of disease for oral cavity conditions averages 45 percent[5] globally, higher than any other of the noncommunicable diseases [2]. At the same time, it is largely possible to prevent these diseases. Oral diseases affect oral health, but oral health as a concept is broader than the absence of oral disease. WHO defines oral health as a condition of the mouth, teeth and orofacial[6] the structures that enable individuals to perform essential functions such as eating, breathing and speaking. It includes psychosocial dimensions such as self-confidence, well-being and the ability to socialize and work without pain, discomfort or embarrassment [3].

Oral health is a fundamental part of general health, and oral health affects general health, just as general health affects oral health. Many risk factors are the same for diseases and conditions in the mouth as for other health. Tobacco use, risky use of alcohol and unhealthy eating habits with a lot of added sugar are modifiable risk factors for most diseases and conditions in the mouth. They are also common to other lifestyle-related diseases such as cardiovascular disease [4, 5], cancer, chronic respiratory disease [6, 7] and type 2 diabetes [8]. Individuality opportunities and conditions to influence the risk factors vary, however. Individual living habits interact with the individual's social and societal network, living and working conditions and general socio-economic, cultural and environmental conditions as well as with non-controllable factors such as gender, age and heredity [2, 9].

The conditions in which individuals are born, grow up, live, work and age in affect behavior and what opportunities and choices are available, and are also usually described as the social determinants of health [10].

Oral health is generally good in Sweden, in both children and adults. It has improved for most groups since the early 2000s. However, oral health is unequal and differs both between regions and between areas and groups in the same region. Experiencing poor oral health is often associated with low income, foreign background, short education, poor general health and various disabilities [11-13].

In the National Board of Health and Welfare's national guidelines for dental care from 2022, it is stated that dental care needs to work more systematically with assessing risks for diseases in the mouth, and then investigating and treating the causes of various

[5] Refers to the major oral diseases except cancer of the lip/oral cavity.
[6] The structures of the oral cavity and adjacent tissues of the face.

risks and harms – not just the symptoms. The guidelines recommend that dental care should carry out a subsequent cause investigation for all persons, both children and adults, who visit the dental care for examination. Through systematic risk assessments, dental care can allocate resources better according to need and invest more in those with oral health problems, while healthy patients do not need to visit the dental care as often.

What is oral health?

Oral health is thus a broader concept than just the absence of disease or damage in the mouth. The act (2008:145) on state dental care support regulates which dental care the Social Insurance Agency provides state dental care support for. This applies to dental care that "aims to achieve freedom from pain and disease, the ability to eat, chew and speak without major obstacles, or an aesthetically acceptable result", according to chapter 1. Section 3 of the act on state dental care support. This cannot be interpreted as a definition of oral health, but can be seen as an indication of the level of ambition the legislator has for publicly funded dental care.

What is a model?

The assignment is about assessing the conditions for introducing a national model for risk assessment in dental care. As the mapping shows, risk assessments in dental care today take place in different ways, for example with different types of decision support and with different degrees of automation in the decision support.

On behalf of this assignment, the National Board of Health and Welfare assumes that a model for risk assessment means more than just decision support. In this report, by model we mean a concept for decision support; an overall solution that is feasible at national level. Such a model includes, for example, decision support, possible integration into existing record systems and a definition of necessary terms and concepts.

In the report, the term decision support[7] is mainly used as a collective term for various decision support regardless of form, and module or risk assessment module for a decision support that is integrated into a record system.

What is risk?

Risk can be seen as a combination of what we think will happen, and how we value what might happen [14], but there is no uniform definition of the term. Dental care has long been based on the patient's risk of ill health in the mouth, in various ways. In this report, we assume that the risk of ill health i

[7] With the exception of previous investigations.

the mouth includes the risk of developing or worsening a disease, condition or injury in the mouth. It is also important to emphasize the connection between oral health and general health - and that the relationship can go both ways.

What is a risk assessment?

An odontological risk assessment is a process where various negative factors (risk factors) and positive factors (health factors) are weighed together[8] . It aims to predict the individual patient's risk of developing disease or other conditions that pose a risk of impaired oral health. Both risk- and health factors can be influenced to a greater or lesser extent by modifying factors. As an example, it can be mentioned that an unstable social situation, weak economy or low level of education increases the likelihood of lifestyle habits and health priorities that negatively affect, for example, dental contact, dietary habits and self-care. A particular challenge is to assess the total risk for patients who have extensive risk factors, but also significant health factors that balance the risk. It is important to also take care of what is good and not just focus on risks.

Other investigations

In recent years, the dental care area has been the subject of several government investigations. In the following section, we report on a selection of other investigations that are significant for this government mission.

The investigation *When the need may rule – a dental care system for a more equal dental health* (SOU 2021:8) had the task of investigating and proposing how the dental care system can be developed to achieve a more equal dental health and a more resource-efficient dental care system. In the investigation's final report comprehensive reforms of the dental care system are proposed. Among other things, it is proposed that ethical principles for dental care priorities be introduced in the Dental Care Act, corresponding to what previously applies to other healthcare through ch. 3. 1 Health Care Act (2017:30), HSL.

Furthermore, the investigation suggested that the dental health register be expanded to include dental health and oral status as well as regular and complete dental care for children and young adults. One of the proposals includes that a uniform individual risk assessment must be made for all patients in Swedish dental care. To that end, the inquiry proposed that a national model for risk assessment be developed, including a special risk assessment system adapted for children and young adults.

The investigation also proposed a new selective dental care support as part of the state dental care support, as well as national knowledge base for a more

[8] Read more about risk and health factors on Science and Health's website.

uniform care and treatment as well as a regional dental care support in collaboration with the health and medical care for adults with special needs.

In October 2023, the government inquiry into strengthened support for dental care for victims of violence and increased control over the dental care sector (S 2022:12) received an additional directive (Dir 2023:138) to submit proposals for strengthened high-cost protection. Interim reports on strengthened support for victims of violence and increased control over the dental care sector were submitted in February 2023 and December 2023, respectively.

The task of strengthening support for dental care for victims of violence was to review strengthened access to dental care for victims of violence and to submit proposals that strengthen their right to compensation in the event of dental damage. In the interim report, it is proposed that dental care for injuries after violence in close relationships should not cost more than one doctor's visit. Furthermore, it is proposed, among other things, that dental care should be covered by the same obligations as other health care in matters of violence in close relationships, that dental care be given the conditions to document signs of exposure to violence regardless of where on the body the signs appear, that initiatives be taken to ask questions about exposure to violence to all patients as part of medical history taking and that direct contact routes to other healthcare, social services, police and voluntary organizations are facilitated.

The task of increased control over the dental care sector meant submitting proposals that contribute to increased control of the dental care sector in order to get things right with unscrupulous actors abusing the state dental care support. In the partial report there are proposals in a number of areas, including conditions that must be met in order to be allowed to provide dental care according to the Dental Care Act (among other things it is proposed that permission be required from the Inspectorate for Care and Care), conditions for being connected to the Social Insurance Agency's electronic system for state dental care support and proposals for which conditions must be met for payment in the event of a compensation request to the Social Insurance Agency.

In the assignment to submit proposals for a strengthened high-cost cover, it is stated that dental care's high-cost cover should be strengthened to more closely emulate the high-cost cover of health care. Elderly people with the worst oral health must be prioritized. At the same time, the reform must be designed in a way that makes it possible to include the rest of the population. The assignment must be reported by 30 November 2024 at the latest.

Today's dental care system

In this chapter, we briefly explain how the dental care system works today and how it relates to the various parts of the other health and medical care.

Swedish dental care covers the following areas:

- *dental care for children and young adults*
- *dental care for patients with special needs*
- *adult dental care within the state dental care support*
- *other dental care, for example aesthetic, which is not covered by the dental care support.*

Management of dental care

Dental care is defined in the Dental Care Act (1985:125), TL, while health care is defined in the Health Care Act (2017:30), HSL. *Dental care* is defined as measures to prevent, investigate and treat diseases and injuries in the oral cavity[9] while *healthcare* is defined as measures to medically prevent, investigate and treat diseases and injuries[10] .

Dental care includes all measures caused by diseases in the oral cavity, teeth, jaws and the surrounding tissues, but measures due to malignant (malignant) tumors are not counted as dental care[11] . This is evident from the preparatory work for TL.

The Health and Medical Care Act does not apply to dental care, but dental care is in some cases included in the area of *health and medical care,* for example in the Patient Safety Act (2010:659). The line between dental care and healthcare is clear from the legislator's perspective, but is not simple in practice. It is not possible to draw a clear line, but an assessment must be made in each individual case.

Knowledge management in both healthcare and dental care is based on a national model for open priorities in healthcare, which among other things, the national guidelines are based on. Unlike health care, dental care is not governed by the basic ethical principles for prioritizing public resources, see the section *Ethical principles for prioritization.*

Goals for dental care

The goal of dental care is good dental health and dental care on equal terms for the entire population[12] . Dental care must be conducted in such a way that it meets the requirement for good dental care. This means, among other things, that it must

[9] Section 1 of the Dental Care Act (1985:125)

[10] 2 ch. Section 1 of the Health and Medical Services Act, HSL

[11] Prop. 1984/85:79 with proposals for dental care act etc. 55

[12] Section 2 of the Dental Care Act (1985:125)

meet the patient's need for security in care and build on respect for the patient's self-determination and integrity. As far as possible, care must be designed and implemented in consultation with the patient. The patient must receive information about his dental health condition and about the treatment methods that are available13 .

National guidelines

The National Board of Health and Welfare produces recommendations in areas where there is a need for guidance. The national guidelines for dental care are more comprehensive than other guideline areas. This is due, among other things, to the fact that they are used as support for TLV when they come up with which measures should be included in the state dental care support. Updated national dental guidelines were published in 2021 and issued in a final version in 2022.
The recommendations in the national guidelines apply above all to
group level, and they are not comprehensive. In the guidelines, the National Board of Health and Welfare gives recommendations for dental care for children and adults.

Compensation system and financing

Patients account for the largest part (57 percent) of the total dental care costs in Sweden, when all dental care support is included. The state finances part of the cost for adults from the age of 24, but the degree of self-financing is still high compared to health care, where patients account for 13 percent of the costs [15]. The regions finance child and youth dental care, certain specialist dental care and certain dental support for adults with special needs.

Dental support financed by government

The state dental care support is regulated in the Act on state dental care support (2008:145)14. It consists of a general dental care allowance (ATB), high-cost protection and a special dental care allowance (STB). ATB is general support for regular dental care visits and aims to create conditions for maintaining good oral health in individuals with no or little dental care needs. The high-cost cover should make it possible for adults with major dental care needs to get dental care at a reasonable cost. Patients can receive this support for dental treatment that helps to remedy pain or disease, provide the ability to eat, chew or speak without major obstacles and provide an aesthetically acceptable result. STB is a grant that can be used for preventive measures for people with conditions that pose a risk of deteriorating dental health. Dental care within the state dental care support is financed to 65 percent by the patients themselves through patient fees or through subscription dental care offered by

[13] Sections 3-3b of the Dental Care Act (1985:125)

[14] The Act contains provisions on compensation to healthcare providers for dental care performed (Chapter 1 § 1).

public dental care. There is free pricing within the dental care covered by the state dental care support.

The state dental care support is available in the form of

- *general dental care allowance (ATB)*
- *dental care compensation (high-cost protection)*
- *special dental care allowance (STB).* [15]

Society's resources do not cover all the activities carried out in dental care.
Adult dental care within the framework of the state dental care support makes up approximately 60 percent of the Swedish dental care market. In addition to society's commitment to dental care, dental care is provided outside the state and regional dental care subsidies. It is mostly aesthetic dentistry and other aesthetic treatment according to the Act (2021:363) on aesthetic surgical procedures and aesthetic injection treatments. Dental and Pharmaceutical Benefits Agency, TLV, calculates the scope of this dental care to be between five and six billion kroner annually, which can be compared with the patient fees within the state dental care support which in 2022 amounted to 12.6 billion[16]. Aesthetic dental care is predominantly carried out by private dental care.

The state dental care support is administered by Försäkringskassan. Tel decides on the rules for the high-cost protection. As a basis for the rules, TLV is based on the national guidelines drawn up by the National Board of Health and Welfare. Thus, dental support also contributes to more knowledge-based, efficient and equal care. The regions are also based on TLV's regulations in their instructions on which dental care can be provided within the regionally funded dental care support.

The region's responsibility

The regions have a statutory responsibility to offer dental care to those who reside or stay within the region16 . Dental care that the region provides itself is called public dental care. A region may enter into an agreement with someone else to perform the tasks for which the region and its public dental care are responsible17 .

The regions are responsible for dental care for children and young adults. They must also offer and replace certain dental care for adults with special needs for dental care. For children and young adults, dental care is free of charge for the patient. For adults in need of special support from dental interventions, the individual patient only pays fees that refer to open health and

[15] See chapter 1 § 1 of the act on state dental care support.

[16] Sections 5–6 of the Dental Care Act (1985:125)

[17] Section 5 of the Dental Care Act (1985:125)

healthcare18 . A certain part of the operation is completely free of charge for the patient. Which dental care is covered by this is regulated in the dental care regulation. In the following section, subscription dental care and outreach activities are described.

In summary, the regions are responsible for, and finance

- *dental care for children and young people19*
- *dental care for asylum seekers20*
- *dental care for certain foreigners who are staying in Sweden without the necessary permits21*
- *oral surgical procedures22*
- *dental care as part of disease treatment23*
- *dental care for people with a long-term illness or disability24*
- *dental care for people who are extremely afraid of dental care25*
- *replacement of dental fillings26*
- *outreach activities27*
- *necessary dental care28*

Outreach

Outreach includes people with an extensive and long-term care need and people covered by the Act (1993:387) on support and services for certain disabled people, LSS. The persons covered are entitled to a free oral health assessment at home and to necessary dental care at the same fee as open healthcare. The outreach activities are included as part of the dental care support for certain elderly and disabled people. Those who are entitled to it must be offered a free oral health assessment once a year. It is a simplified check of the oral cavity, teeth and dental replacements carried out by a licensed dental hygienist or licensed dentist in the home (ordinary resident or special resident). The purpose is to give individual advice on oral hygiene to

[18] See Section 1 of the Dental Care Ordinance (SFS 1998:1338)

[19] Section 7 of the Dental Care Act (1985:125)

[20] The Act (2008:344) on health care for asylum seekers etc.

[21] The Act (2013:407) on health care for certain foreigners staying in Sweden without the necessary permits

[22] Section 2 of the Dental Care Ordinance (1998:1338)

[23] Section 3 of the Dental Care Ordinance (1998:1338)

[24] Section 3a of the Dental Care Ordinance (1998:1338)

[25] Section 4 of the Dental Care Ordinance (1998:1338)

[26] Sections 6–7 of the Dental Care Ordinance (1998:1338)

[27] Section 8 of the Dental Care Ordinance (1998:1338)

[28] Section 9 of the Dental Care Ordinance (1998:1338)

the patient and to the caregiver, to maintain daily oral care. In connection with the oral health assessment, it is also assessed whether the person needs dental care that can be considered necessary.

Subscription dental care

Subscription dental care means that the patient enters into an agreement with their healthcare provider to receive dental care at a fixed price for a certain number of years [17]. The public dental care organizations provide subscription dental care according to a nationally developed contract model, called *healthy dental care.* The healthy dental care agreement includes examinations and investigations, health-promoting efforts such as instructions and dietary advice, emergency dental care and treatment of disease and pain conditions such as caries, root canal treatment and tooth loss.
In addition, restorative care is included in the form of fillings and individual tooth-supported crowns of standard materials. Before the healthy dental care agreement is signed, an examination of the patient is carried out. If the examination shows that the patient then needs some form of treatment, this is carried out before the agreement comes into force. For this, the patient pays the healthcare provider's price for the treatment with the support of the state dental care support's high-cost protection. When the patient has been treated, a risk assessment is made which places the patient in a fee class. The higher the risk of developing diseases or injuries in the mouth, the higher the risk class. The prices of the fee classes are determined by the respective region. After the contract period of three years, the dental care performs a new risk assessment to check that the patient is still in the correct risk class. They also draw up a personal care program for self-care, preventive care and treatment based on the risk assessment made by the patient's therapist. If the patient does not follow the self-care program, the public dental service can terminate the agreement.

Revision interval – the time between two baseline examinations

In the national guidelines from 2022, it is recommended that the time period between two basic examinations29 for adults should be between 12 and 36 months, and that high-risk patients should come more often than low-risk patients [18].
The time between two basic examinations is also usually called the revision interval. This means that dental care is one of the few actors that regularly see most children and adults, often before they have a health problem for which they need to seek dental or other care.

The part of dentistry that sees patients regularly for examinations is often referred to as general dentistry. It can be compared to primary care in the healthcare system. But there is no equivalent in primary care

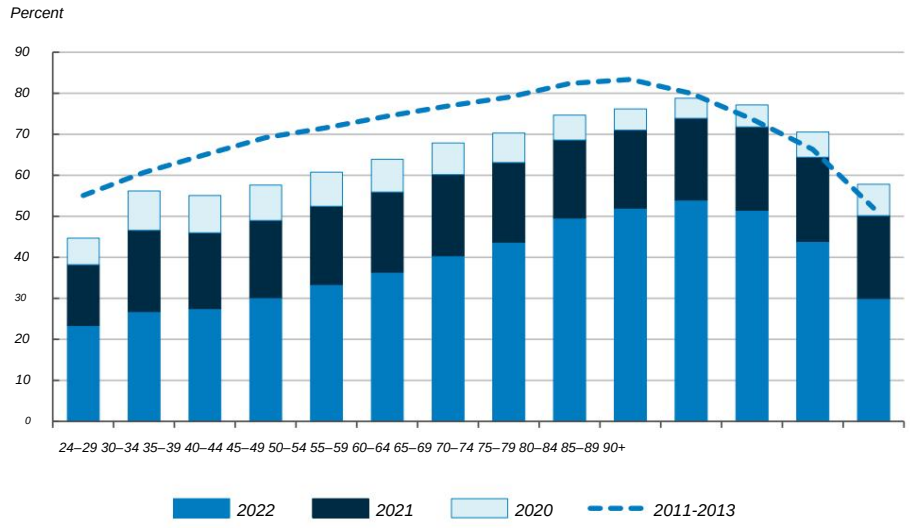
[29] A basic examination must be applied in dental care for examination and diagnostics of dental and oral health with feedback to the patient and, where applicable, minor preventive treatment. The basic examination can be performed by a dentist or dental hygienist.

system for risk assessments for the entire population, where healthcare professionals regularly examine and take a position on patients' risk of developing or worsening disease. However, risk assessments are carried out in a number of situations within health care with different purposes. This can, for example, be about identifying care needs or prioritizing between patients in a situation with many care seekers or a large need for care.

Data from the National Board of Health and Welfare's dental health register show that there are differences in how often adult patients visit dental care for a recurring basic examination within the state dental care support. Patients with many damaged or repaired teeth are called at shorter intervals than patients without damaged and repaired teeth. Since repairs are accumulated over a lifetime, the elderly are overrepresented in the group with many repaired teeth, and it is also older people who visit the dental care to the greatest extent, see figure 1.

Figure 1. Proportion of the population that underwent at least one basic examination.

Proportion of the population, aged 24 and over, who underwent a basic examination at least once the last year, the last two years or the last three years, distributed by last year of visit and age compared to the dashed line for the years 2011–2013.

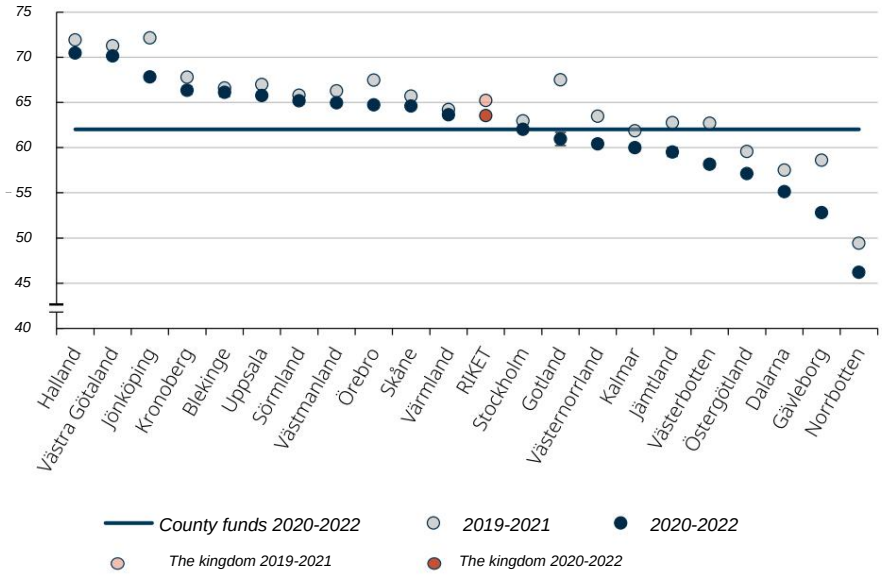


Source: National Board of Health and Welfare, Dental Health Register.

The proportion of the population that visited dental care for an examination in the past three years decreased between the two most recent measurement periods (2019–2021 and 2020–2022). The reduction applies to all regions and is partly due to the effects of the corona pandemic, see figure 2. There is great variation in visit frequency between regions, as well as between women and men, see figure 3. Women visit dental care to a greater extent than men, in all regions. In Norrbotten, less than half of the residents visited the dental care for an examination, while around 70 percent of the residents in Halland and Västra

Götaland visited the dental care for an examination in the last two measurement periods, see figure 2.

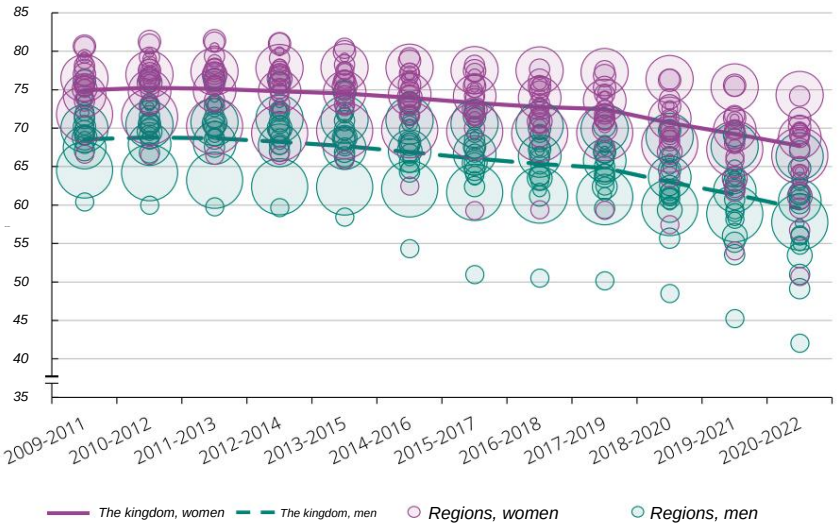
Figure 2. Dental examination last three years – development.
Number of people per 100 inhabitants who had an examination carried out sometime during the last three-year period, adult dental care, age-standardized values.



Source: National Board of Health and Welfare, Dental Health Register.

Figure 3. Dental examination last three years - difference between the sexes

Number of people per 100 inhabitants who had a basic examination carried out sometime during the last three-year period, adult dental care, age-standardized values.

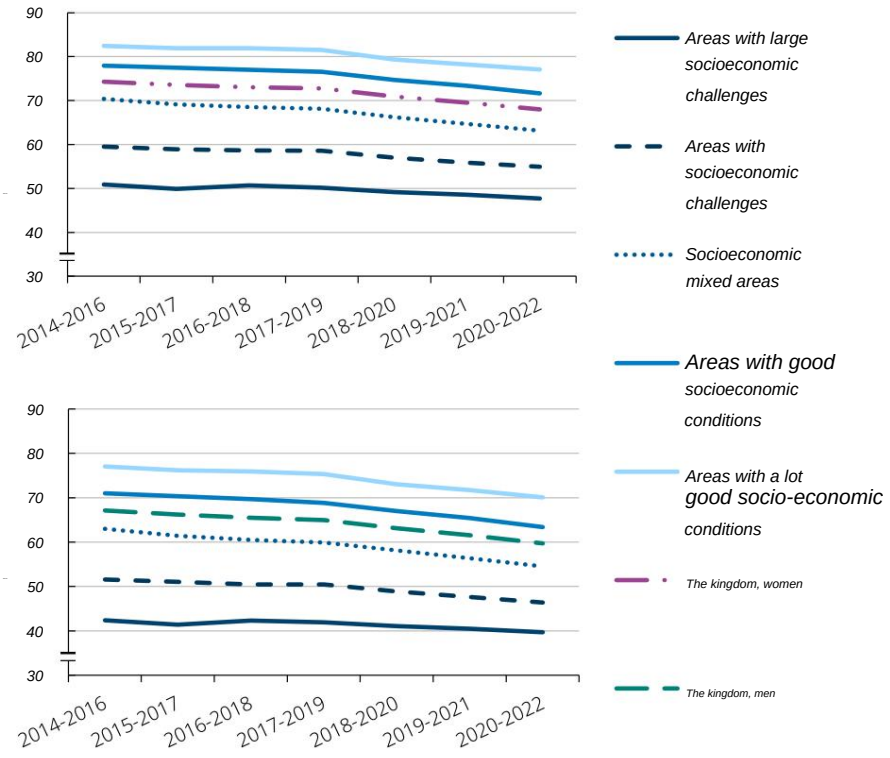


Source: National Board of Health and Welfare, Dental Health Register.

There are also differences in the interval between two baseline examinations depending on where the patients live. Patients from socio-economically weak areas generally have longer revision intervals than patients from areas with good socio-economic conditions. Low-income people tend to visit dental care to a lesser extent, but in return they consume more dental care once they do visit dental care [19].

Figure 4. Dental examination last three years - difference between gender and different socio-economic background.

Number of people per 100 inhabitants who had a basic examination carried out sometime during the last three-year period, adult dental care, age-standardised values.



Source: The National Board of Health and Welfare, the Dental Register and Statistics Norway.

You can read more about the frequency of visits to dental care in the National Board of Health and Welfare's progress report *The state and development in health, medical and dental care 2024[20].*

The SKaPa quality register collects statistics on risk assessments and audit intervals. Today, all public dental care organizations and 826 private practices are connected. Statistics from 2022 [21] indicate that there is only a small difference in audit intervals depending on the risk group

belongs to30, see Table 1. For the recommended revision intervals to followed, individuals classified as high risk should have shorter audit intervals than those with lower risk31 .

Table 1. Average number of months between baseline examination.

Sorted by organization and risk group for the age range 24 years and older, in 2022.

Organisation	Low risk group from 24 years	Moderate risk group from 24 years	High risk group from 24 years
Average value all	**26,3**	**23,1**	**21,5**
FTV Sörmland	27,1	19,6	18,5
FTV Jamtland	26,6	24,2	21,7
FTV Östergötland	37,0	33,3	29,9
FTV Värmland	41,1	31,5	21,0
FTV Jönköping	30,5	24,2	21,5
FTV Blekinge	27,5	25,7	25,0
FTV Dalarna	31,8	30,0	27,5
FTV Kronoberg	25,0	22,1	21,4
FTV Uppsala	28,2	26,6	25,0
FTV Västernorrland	29,5	24,7	21,9
FTV Norrbotten	32,8	28,2	22,3
FTV Örebro	29,4	26,8	26,9
FTV Halland	29,3	24,5	19,6
FTV Scania	21,9	19,3	18,3
FTV Västra Götaland	24,1	22,7	20,9
FTV Västerbotten	32,6	28,9	24,5
Intern service	24,3	18,7	24,0

Source: SkaPa 2022.

Risk assessments in dentistry

Risk assessments are part of dental care's working methods. They should be the basis for the treatment the patient receives and for decisions about when the patient needs it

[30] The risk grouping is based on data from the decision supports that classify patients into risk groups and reports data to SkaPa.

[31] The revision interval is influenced by both the therapist's assessment, the patient's wishes and ultimately og sidst once the patient arrives at the dentist.

visit the dentist for the next basic examination. The result of the individual the risk assessment is also the basis for which treatment and preventive measures the dental care follows up at each visit.

The risk assessment is included as part of a basic survey, but the content or execution of risk assessments is not further defined by TLV [22]. In the National Board of Health and Welfare's national guidelines for dental care, it is stated that dental care needs to work more systematically with risk assessments and more disease prevention, by, among other things, assessing risks for diseases in the mouth and investigating and treating the causes of risks and injuries [18].

The assessment must then form a basis for planning the continued care in consultation with the patient [23]. The risk assessments also serve as support for dental care to prioritize between patients.

With the support of systematic working methods, dental care can call each patient one basic examination based on an assessment of the patient's needs. According to the national guidelines, individuals judged to be at high risk for poor oral health should receive a shorter interval between visits than individuals at low risk.

The risk assessment can be supported by digital decision support, for example in the form of an integrated module in the record system.

The Swedish quality register for caries and periodontitis (SKaPa) currently collects data on risk assessments. Development work is underway within SKaPa to use AI to analyze how the risk assessments develop over time and to what extent the risk assessments lead to treatment measures and affect audit intervals. In any continued work to develop a national model for risk assessment, this work within SKaPa may be taken into account.

Method and implementation

In order to carry out the assignment, the National Board of Health and Welfare has mapped current decision support for risk assessment. We have reviewed how these work and are used today and investigated how dental professionals perceive the need for support for risk assessments, today and in the future. The mapping has taken place by

- a survey aimed at business managers at private and public clinics
- focus groups with dentists and dental hygienists
- dialogue meetings with record system suppliers and representatives from various operations.

The mapping has also included identifying particular patient groups, for whom special consideration may need to be taken to ensure that their situation and needs are recognized in a national risk assessment model.

The National Board of Health and Welfare has through a literature search and review of selected texts mapped foreign guidelines for audit intervals or risk assessments.
Work on examining the scientific basis for risk assessments and risk assessment models has begun through collaboration with SBU.

The National Board of Health and Welfare has also conducted workshops with an expert group consisting of five of the National Board of Health and Welfare's scientific councils in dentistry as well as another professor with expertise in community dentistry. The aim was to gather opinions on the scientific prerequisites for introducing a national model for risk assessment. In the following sections, we describe each method in more detail.

Survey for business managers

The National Board of Health and Welfare conducted a survey in the summer of 2023 to map which decision aids are used for risk assessment in dental care, and to gain a better understanding of how they are used. The target group for the survey was operational managers at public and private general dental clinics.

The questionnaire was sent to a total of 1,140 dental clinics, of which 630 were private and 510 public clinics. The selection was based on the number of measures reported to Försäkringskassan within the framework of the state dental care support during the period January to March 2023. We excluded clinics that had fewer than 100 reported measures, were specialist clinics, universities or emergency departments. A random sample was then drawn[32] .

[32] The selection was a stratified selection with spread in terms of region and type of clinic which stratum variables. The outreach activities were added to the population after the selection for the other clinics was made.

The questionnaire was also sent to 30 outreach activities within the framework of necessary dental care. The National Board of Health and Welfare conducted consultations with Sweden's Municipalities and Regions (SKR) and the Norwegian Business Administration's Regulatory Board (NNR) before we sent out the survey with an electronic survey tool at the beginning of June. The response period was until September 4, 2023, and two reminders were sent out. Quantitative results from the survey are reported as shares in percent[33] .

Focus groups with treating staff

As part of the survey, the National Board of Health and Welfare has obtained the opinions and experiences of treating staff. The aim has been both to investigate perceptions of existing decision support for risk assessments and possible requests for and needs for future decision support from the professional groups within dentistry that carry out risk assessments today. With the help of a consulting company, focus group interviews were conducted with dentists and dental hygienists[34] . Focus groups were used to gain increased knowledge about treating dental staff's perceptions of a national model for risk assessment, and about opportunities and limitations in working according to such a model.

Participants from private clinics were recruited through a request to the 243 private clinics that responded to the survey within the scope of the assignment. Participants from public clinics were recruited by
The respective public dental care organization forwarded the request within their own organization.

In order to increase participation and above all to reach employees from private clinics and dental hygienists, targeted invitations were also sent to these groups, via Private Dentists and Sweden's Dental Hygienist Association.
The fact that the approach to recruiting participants for the focus groups was changed during the interview period is not perceived to have affected the content of the conversations.

Each conversation in the focus group was carried out with the support of at least two consultants to facilitate the discussions and secure opportunities to document them.
A developed interview guide guided the discussions in the focus groups and made it possible to compare the groups. The interview guide was sent out to the participants before each focus group so that they could prepare.
The conversations in the focus groups were conducted digitally. The focus groups varied between two and ten participants, and the conversations lasted between 1 and 1.5 hours

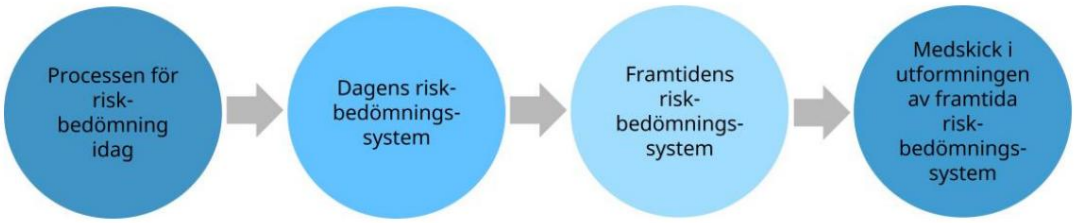
[33] The proportions have been calculated weighted because a stratified sample was made before the survey was sent out. It means that some answers have gained more importance than others, as they represent a larger group in the population.

[34] For a complete method review, see the final report from the consulting company. It can be requested via document number 5.7-18569/2023-20 from the National Board of Health and Welfare's registry.

depending on the number of participants. The focus groups were conducted between week 41 and week 46 of 2023.

Each focus group conversation followed the same structure where four areas were discussed with the support of visual material, see Figure 5 below.

Figure 5. Question areas in focus group interviews.



The first conversations in the focus groups generated a diversity of perspectives and input. As more conversations were conducted, comments and patterns began to repeat themselves. On most issues there was consensus among the participants in the various focus groups, while on other issues nuances and perspectives were added. After about ten conversations, however, relatively few new arguments emerged, which indicates that a certain point of saturation was reached relatively early in the implementation.

Environmental analysis

Nordic environmental analysis

As part of the environmental analysis, the National Board of Health and Welfare has carried out a Nordic outlook. This has consisted of a dialogue with the Nordic countries' Chief Dental Officers (CDOs) via email and digital meetings. The National Board of Health and Welfare also organized a digital dialogue meeting on risk assessments and audit intervals in dental care in the Nordics during December 2023. CDOs and other dental care experts from Denmark, Finland, Norway and Sweden participated.

Literature search for foreign guidelines on risk assessment

In order to identify foreign guidelines on risk assessment or decisions on audit intervals, in December 2023 the National Board of Health and Welfare conducted a literature search in the PubMed database and via international authorities and organizations, see appendix 2. We have identified and described guidelines that contain recommendations or advice on risk assessment and audit intervals. These guidelines can be quality-checked in a later step, for example with the tool AGREE2[24, 25]. If they are judged to be of good methodological quality, they can be adapted to a Swedish context with GRADE adolopment [26].

Literature search for scientific basis for risk assessments

SBU has examined the scientific basis At the request of the

National Board of

Health and Welfare, SBU has searched for and assessed the scientific basis for an overall risk assessment model in dental care. Within the framework of its government mandate to support the National Board of Health and Welfare[35] SBU has also reviewed scientific studies that have evaluated prediction models[36] for the individual disease conditions caries and periodontitis. The work includes definition of the question, systematic literature search, review of literature and evidence grading of the results from identified literature. SBU works according to a method that you can read more about on SBU's website[37] .

Dialogues

A large number of dialogues have been carried out during the course of the project, with many different participants. The purpose of the dialogues has been, among other things, to acquire knowledge about how current decision support for risk assessments works, is updated and is used - with a focus on such decision support that is included as modules in the dental record system.

Expert group

In order to identify factors of importance for a national risk assessment model, opinions have also been obtained from an odontological expert group consisting of five of the National Board of Health and Welfare's scientific councils in odontology and a professor with expertise in community odontology.
The expert group has participated in two workshops and discussed the prerequisites for a national model for risk assessment as well as relevant risk and health factors.

Journal System Providers

The project has carried out digital dialogues with all seven record system suppliers active in the Swedish dental care market under 2023[38] . The dialogues were carried out during September 2023. The aim was to

[35] S2023/01926 Government. Assignment to support the work of assessing the conditions for a introduction of a national model for risk assessment in dentistry, SBU.

[36] In accordance with the SBU's definition, prediction models refer to methods that aim to identify patient-specific risk factors and that can predict the prognosis for the individual patient.

[37] See SBU's website.

[38] One of the suppliers will leave the dental care market in 2024.

gain an increased understanding of how the decision support for risk assessments that exist integrated in the record systems work, develop and update, as well as to get increased understanding of the information structure of the record systems. Individual customers may have different solutions with the respective journal system supplier. IN however, the National Board of Health and Welfare has based the mapping on a general picture provided by the respective record system supplier, and where applicable also their customers.

Reference group, working groups and operations

During the course of the work, the National Board of Health and Welfare has held a dialogue with various actors in dental care, including in the form of an external reference group that assisted the authority. The external reference group has consisted of representatives of the regions' dental care network, Folkdental Care Association, SKR, Private Dentists, Dental Association, Dental Hygienist Association, Dental Association, Practitioner service and national program area dental care. In addition, dialogues have been conducted with, among others, developers and administrators of various decision supports for risk assessment, the Norwegian Dental Association's working group for healthy dental care, health informatics and other experts in various parts of dental care operations. Dialogue has also been held with SBU, TLV and Försäkringskassan.

Mapping of risk assessments and decision support for risk assessment

In this section, the National Board of Health and Welfare reports on the authority's mapping of risk assessments and of the decision support currently used to make risk assessments.

In the mapping, we have investigated

- which decision aids are used to make risk assessments
- how the decision support works
- how the therapists use and perceive the decision aids
- what the processors use the risk assessment results for.

As stated in the method section, the mapping is based on a survey to business managers, focus groups with dentists and dental hygienists as well as dialogues with record system suppliers and businesses. The results from the different parts overlap and confirm each other. These results are supplemented with a global analysis, which highlights how the other Nordic countries work with risk assessments and audit intervals.

Response rate survey and participation in focus groups

The response rate for the survey was 47 percent, see table 2. Some regions provided central survey responses that were stated to apply to all public clinics in the region or groups of such39. The central answers have been given a increased weight to represent all public dental clinics that did not themselves answer the survey in the relevant regions. However, all responses provided by the clinics themselves have been included in the analysis and not replaced by any central responses, see table 2.

[39] The Västra Götaland region, Skåne, Norrbotten and Gävleborg

Table 2. Response frequency40 questionnaire survey.

Accounting group	Number in the sample	amount of answers	Response rate from the sample (%)
Public dental care	353	206	58
Private dental care	622	245	39
Outreach (all regions)	30	21	70
Total	1 005	472	47

Source: National Board of Health and Welfare.

There were a total of 75 people who participated in the focus group discussions, of which 35 from public dental care and 40 from private dental care, see table 3. A total of 104 people booked into focus groups, but 29 of these people did not attend or reported obstacles. Participants who were prevented and could not be rebooked were offered the opportunity to submit written responses; nine people provided answers via email. A total of 84 people participated in the data collection – 62 dentists and 22 dental hygienists. Of Sweden's 21 regions, participants from public dental care in 19 regions participated in one of the focus groups, or provided answers via email41. In summary, the participation in the focus groups has been summed up to a total of 24 focus groups with 75 participants, see table 3.

Table 3. Number of focus groups and participants.

Number divided into public dental care and private dental care.

Accounting group	Number of focus groups	Number of participants
Public dental care	10	35
Private dental care	14	40
Total	24	75

Source: The consulting company that conducted the focus groups.

Risk assessments today

Dentists and dental hygienists regularly carry out risk assessments of patients. People in these occupational groups must demonstrate that they have knowledge of how to carry out a risk assessment in order to obtain a Swedish professional identification. The risk assessments are often carried out with the help of different types of support, for example decision support that is integrated into record systems, routines or guidelines, other documentation or systems. In the survey answered

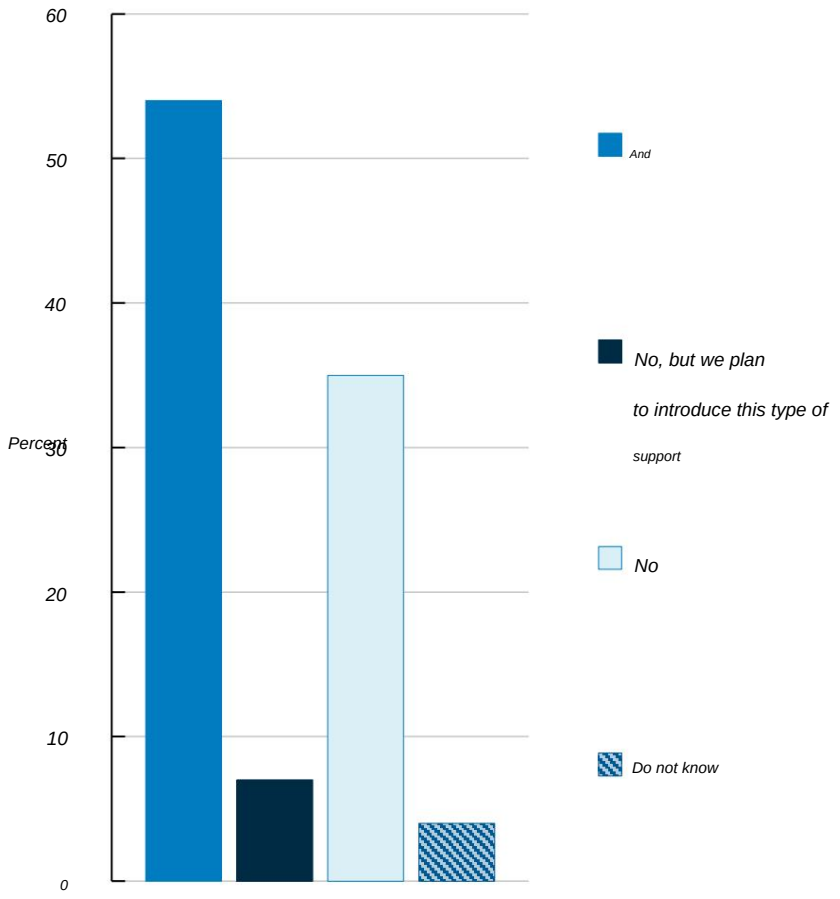
[40] All public dental clinics in the regions that provided central responses are excluded from the response frequency calculations, as it can be assumed that the reason they did not respond individually is that central survey responses were provided.

[41] Gotland and Östergötland did not appear.

54 percent of the clinics that they use some form of support in the risk assessments, see figure 6. Almost all public clinics (98 percent) answered that they use some form of support in the risk assessments.
The corresponding figure for the private clinics was 44 percent. Another eight percent of the private clinics answered that they plan to introduce this type of support. There were slightly more of the private clinics with three or more practicing dentists or dental hygienists who responded that they use, or plan to introduce, some form of support (65 percent), compared to private clinics with only one or two practicing dentists or dental hygienists (38 percent).

Figure 6. Use of support for risk assessments.

Do you use any form of support for risk assessments in your business? Support can be, for example, a module in a record system, guidelines/ routines or other documentation.



Source: The National Board of Health and Welfare's survey, 2023.

In the focus groups, all treating staff within public authorities stated that they carry out risk assessments. They often showed relatively advanced decision support, linked to the respective record system. The staff feels that it is self-evident to carry out a risk assessment. Within private management, there are staff who see development potential in their risk assessments. Among other things, it was mentioned that they did not consider themselves to have access to any flexible decision support (that they

modules that are part of journal systems are not considered relevant). Some also mentioned that they felt that the individual assessment of the patient's needs is sufficient, more fair and quicker to do. There are also examples of clinics that have developed their own templates and guidelines for risk assessment that they believe are more useful than those included in the record system.

Risk assessment modules in the medical record systems

There are currently seven different record system suppliers on the Swedish dental care market. The National Board of Health and Welfare has started from a general picture provided by the respective record system supplier. All offer some form of risk assessment module integrated into the medical record systems. They serve as decision support for the therapists when they assess the risk of patients, and are used by both public and private clinics. It varies to what extent these modules retrieve information from other systems or modules in the medical records system. All regions except one can use some type of decision support for risk assessments in the records system.

Two different main types of decision support are used by the regions. 16 regions use the risk assessment module R2, with slightly different execution, while four regions use a support developed by the users of the Lifecare record system. The combined risk calculated for each patient is based in these two systems on a number of variables where risk factors are assessed based on a risk grouping scale. Other risk assessment modules integrated into the systems of record vary in the degree to which they calculate and suggest weighted risk groups. Some of these decision aids are structured as a separate part of the record system where the processor manually fills in the data, and there is no calculation of any weighted risk. In other modules, a weighted risk is calculated based on a risk grouping scale for various separate risk factors that are either entered manually or obtained from other parts of the medical record[42] .

Those who administer the regions' risk assessment modules state that the overall purpose of these is to achieve equal care.
The risk assessment results are used both to prioritize between patients and to determine the content of the care. It is about deciding when, what and to whom care should be given.

Decision support that is not part of the record systems

In addition to the risk assessment modules that are integrated into the medical record systems, the businesses reported in the survey that they use different routines and guidelines for diseases, conditions and injuries, or for different patient groups, for example children and young people, frail elderly or patients with specific

[42] For example, for periodontitis and caries.

risk factors. Several clinics stated that they use the book Tandvården's lyme [27], with advice and recommendations for drug use in dental care, as a decision support. Several private clinics stated that they follow the region's guidelines, routines or templates for children and young people for various medical conditions, for example caries.

Other reported decision support for risk assessments were the National Board of Health and Welfare's national guidelines, journal and diary entry templates, therapy meetings, therapy planning, courses and training, X-rays, image management systems, internet dentistry, referral management, health declaration, anamnesis, clinical findings, previous dental care and medical history as well as screening for the diseases caries and periodontitis. Personal knowledge – individual knowledge of patients, their finances and motivation – was also reported as support for risk assessments.

A number of clinics reported that they use decision aids that are not integrated into medical record systems. These included Cariogram[43] , Dental Trauma Guide[44] , system for administering regionally funded dental care as well as different quality management systems.

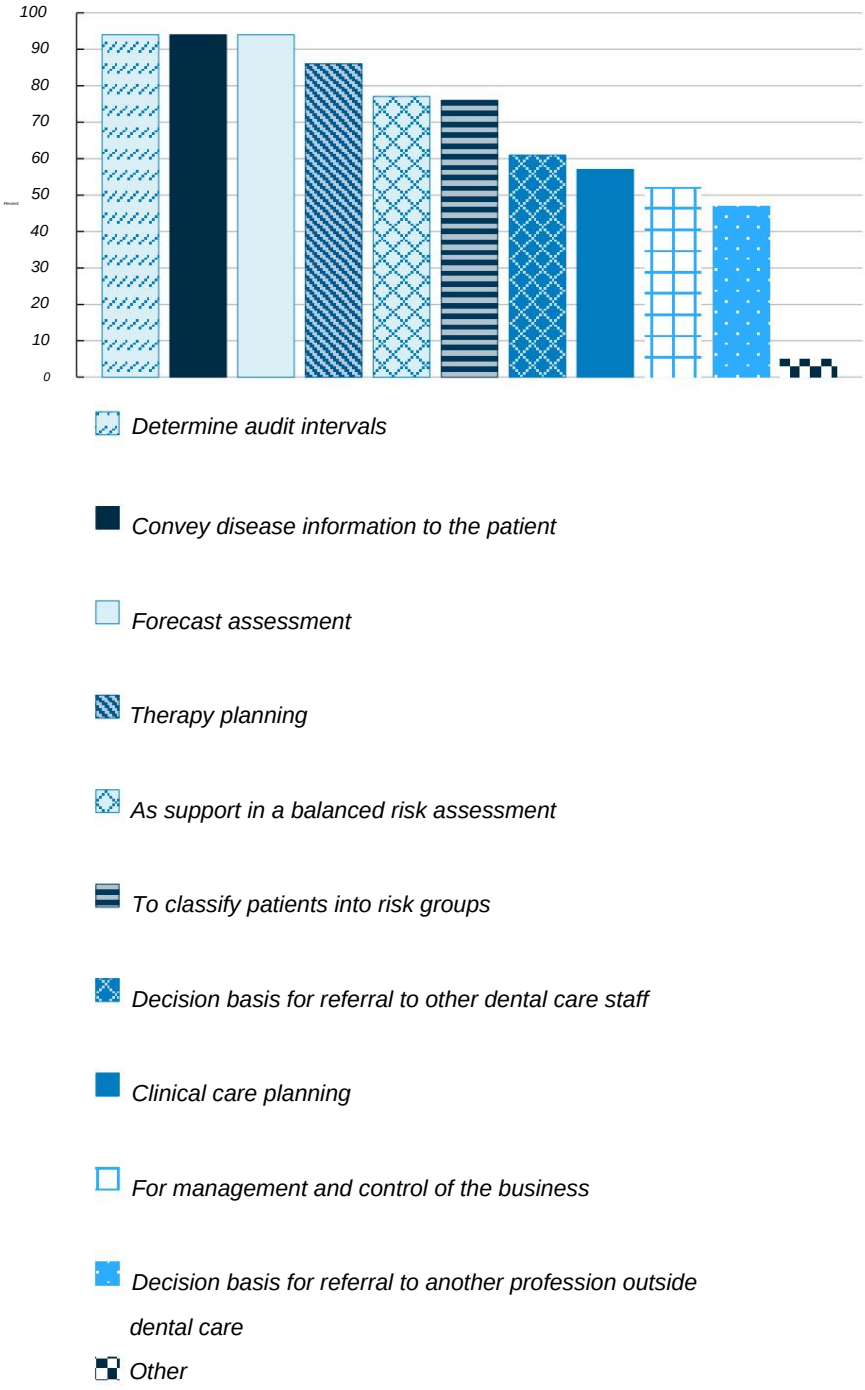
Areas of use of decision support

The survey showed that the decision support for risk assessment is used to fulfill different purposes. The most commonly reported areas of use were to convey disease information to the patient (94 percent), assess prognosis (94 percent) and determine revision intervals (94 percent). Other reported areas of use were therapy planning (86 percent), support in a balanced risk assessment (77 percent), to classify patients in risk groups (76 percent), as a basis for decisions when referring to other dental professionals (61 percent), for clinical care planning (57 percent) , for management and control of the business (52 per cent) and as a basis for decisions when referring to another profession outside of dentistry (47 per cent), see figure 7. A few businesses reported other areas of use, such as prioritization in the event of a lack of resources, research, statistics or support when reporting concerns by children to social services.

[43] A tool for assessing caries risk.
[44] Dental Trauma Guide website

Figure 7. Areas of use for the risk assessment decision aids

What is the risk assessment support used for?



Source: The National Board of Health and Welfare's survey, 2023.

Many focus group participants stated that they use results from the risk assessment in dialogue with the patient by showing the patient the result at each examination. Some participants highlighted that they would like to have more risk groups than they currently have the opportunity to use, but only for

internal use. To communicate with the patient, they believe that three groups are enough.

Use in outreach activities

The survey responses indicate similar areas of use for the decision aids i outreach activities, i.e. for people with extensive and lasting care needs, such as in general dentistry. The six most commonly reported areas of use for general dental care are the same as for outreach[45] .

In outreach activities, patients are classified into risk groups.
67 percent of those who responded to the survey and who use decision support answered that it is used for this purpose. However, there are divided opinions on whether it is possible to assess the risk of disease, condition or injury in the mouth of patients in outreach activities.

Risk grouping in the record systems

In six out of seven medical record systems, it is possible to group patients' assessed risk in different ways. Risk grouping means a categorization of the risk according to a scale, for example 1–3, where 1 can stand for low risk, 2 for moderate risk and 3 for high risk.

It is important to distinguish between the concepts of *risk assessment* and *risk grouping.* The risk assessment is a clinical measure that places the patient on a continuous scale from low risk to high risk. A risk grouping means that there are a certain number of defined risk groups on a scale, in which patients are placed based on how high their risk is. However, a patient's risk continues to be continuous, even if there has been a risk grouping.

The risk grouping in the record systems can take place for each factor that is assessed as risk or by calculating a weighted, "total" risk. In four of the six modules, the patients are placed in a risk group based on the patient's combined total risk. These modules have three or ten risk groups. The other two modules offer the opportunity to group the respective main risk factor included in the risk assessment, with the possibility for the clinic to use up to six risk groups. One supplier states that two to four risk groups are most common. There is also the possibility for individual customers to order customized special solutions from several of the journal system suppliers.

The purpose of the risk grouping is partly to more easily communicate the risk assessment results with the patient, partly to have a basis for deciding

[45] The six are to determine revision intervals, prognosis assessment, convey disease information to the patient, therapy planning, as support in a balanced risk assessment and to classify patients into risk groups.

revision intervals, prioritize between patients and more. In the survey, over three-quarters of the businesses (77 percent) that use a decision support for risk assessments answered that they use it to classify patients into risk groups.

The majority of the businesses responded that they follow up on the outcome of the risk grouping (81 percent)[46] , but the methods for follow-up vary. This takes place, for example, by producing statistics and reports from various follow-up and financial systems, through journal reviews, by reporting to the SKaPa quality register and continuously during audit investigations.

It varies how often the risk grouping of patients is followed up. Many businesses answered in the survey that they follow up the risk grouping based on the patient's needs and when it is time for the next call or at the next examination or visit to the dental care. Other common answers were that follow-up takes place more often than once a year, for example every month, three times a year or once every six months. Almost a quarter of the businesses answered that the follow-up takes place once a year.

The risk groups are also used for subscription dental care

In the regions, the decision support for risk assessments is also used to classify patients into fee classes for subscription dental care, so-called healthy dental care. The businesses in the regions state, however, that it is the same risk assessment that is made of all patients, regardless of whether they have subscription dental care or not.

Within Folktandvårdsföreningen, work has been carried out to harmonize the number of fee classes used for healthy dental care between the regions, and these are now equal in number. Despite the fact that the regions use different decision support for risk assessment, it is felt within Folktandvårdsföreningen that the risk assessments are generally equivalent.

Factors in today's risk assessments

All risk assessment modules provided by the record systems contain a number of main categories of risk factors (hereafter referred to as main risk factors). These are caries, periodontitis, technical risk and general or other risk. However, it varies which underlying factors or main risk factor contains and which information it is based on. Thus, many of the factors are common in the medical record systems, but there is variation, especially among the underlying factors. It also varies how they

[46] 15 percent answered that they do not know and four percent that they do not.

are categorized in the respective systems. Table 4 shows the factors that are most common in the risk assessment modules of the medical record systems.

Table 4. Factors that appear in the risk assessment modules of the medical record systems.

Factors	***Occurrence in risk assessment modules (N=7)***
Medical risk or general illnesses	*6*
Tobacco	*6*
Oral hygiene or hygiene	*6*
Cost	*5*
Fluoride use	*4*
Saliva	*4*
Implants or prosthetics	*4*
Bleeding	*4*

Source: Interviews with the record system suppliers.

Other factors that appear in some but not all modules are tooth wear, caries, erosion, root canals, bite physiology, technical quality, fillings, dental fear, self-rated oral health, cooperation or communication, occlusion index, calculus, endodontics, alveolar bone loss, wisdom teeth, retainers, patient age , oral pathology and mucosal index. It is important to emphasize that the therapist may well consider the above factors in a risk assessment, even if they are not explicitly mentioned in a decision support.

The free text responses from the survey show that the factors that the businesses risk assess to a large extent overlap with the factors found in the risk assessment modules. Common free text answers were, for example, caries, periodontitis, technical risk, general health/general diseases and lifestyle habits such as diet and tobacco use. However, some other commonly reported factors do not appear to the same extent in the mapped risk assessment modules. For example, many businesses state that they risk assess bite physiology and conditions and injuries linked to bite function

as well as medicinal products that can affect oral health. Other examples of reported factors that are risk assessed but not explicitly found in the risk assessment modules are infections, gingivitis, cancers, diabetes and several other diseases that affect both general and oral health.

No uniform structure for terms and definitions

The mapping of existing decision support for risk assessments has shown that today there is no uniform structure for terms, concepts and definitions in dental care. How concepts, such as diagnoses, are defined varies between the record systems. Several journal system suppliers state that TLV's action codes control the design of term codes and that the design is also controlled by customer demand. Three journal systems
offers the possibility to connect attention information47 from the National patient overview via Inera AB. Whether the caregivers use that option varies. In four of the medical record systems there is an opportunity to name risk factors that may pose a risk to the patient's life or health with the help of CAVE marking, but this is structured in different ways in the
different systems.

Perceptions of current decision support and future needs

In this section, the National Board of Health and Welfare describes how treating staff perceive current decision support for risk assessment and what
support for risk assessment they feel is needed. The information is based on the focus groups with dentists and dental hygienists, completed questionnaires and dialogues with representatives of businesses.

Practitioners need to supplement with their experience and clinical competence

Dentists, dental hygienists and operational managers all emphasize that the practitioner needs to be able to supplement the risk suggested by the decision support with their experience and clinical competence. Decision support can be helpful, but the therapist also takes other factors into account and makes an overall assessment of the patient. Many participants from the focus groups believe that it is not possible to rely solely on the system. Instead, a professional assessment of the result is often required and not infrequently a manual adjustment of the risk based on the current patient case. Several answered in the survey that the therapist uses his clinical experience and competence and an overall assessment to assess a patient's risk.

Both dentists and dental hygienists, in both public and private dental care, believe that the professional experience of dentists or dental hygienists affects how they rely on the assessment presented by the decision support. Some take off

[47] Read more about attention information on the National Board of Health and Welfare's website.

also presented continuity in patient contact and personal knowledge as important factors for the risk assessments to be good.

Shared opinions on risk assessments are time-consuming

There are divided opinions on whether the risk assessment itself is time-consuming or not. Many participants highlight that the risk assessment, regardless of the system they use, requires a large number of keystrokes to enter information. They also point out that dentists and dental hygienists often need to switch between systems during the examination. This may also include taking gloves off and on between handling the computer and the patient, which requires time. For example, staff find it time-consuming that medicines used by the patient must be manually entered into the medical record system.
Dentists or dental hygienists also need to make a subjective assessment of the effect of the medicine in question on oral health.

Another factor highlighted as time-consuming concerns clinics in socio-economically vulnerable areas, where residents generally visit dental care less often. These clinics have a greater proportion of patients at high risk of deteriorating dental health, and high risk patients often take longer to assess risk.

Current decision support for risk assessment lacks certain factors

A majority of the participants in the focus groups believe that the decision support they have access to does not include all relevant factors that they feel need to be included in a risk assessment. The factors that are missing concern, among other things, the use of alcohol and drugs, questions about dietary habits, lifestyle and life situation but also social conditions that can affect oral health in different ways. For children, this could be, for example, alternating accommodation, the need for care interventions at home or siblings with caries. The participants highlight above all social factors concerning children or the elderly, partly because the risk assessment for these groups can change in a short time. The majority of the participants in the focus groups feel that there has been no, or very limited, development of decision support in recent years. It also appears in the survey responses that people feel that the current decision support does not work optimally, that it requires the laying on of hands and lacks certain factors, for example to assess bite physiology.

Need for a simple and flexible system

The practitioners express that a national model for risk assessment needs to be simple and not lead to increased administration. A national model should

for example, be able to be integrated into existing record systems, because there is no time space to go in and out of several different systems. Furthermore, they point out that there is a risk that the costs of an investigation will increase if the administrative requirements increase. This would further raise the threshold for those who already find it difficult to go to the dentist for financial reasons. Another perspective that is raised is that the more that has to be documented and included in the examination of healthy patients, the less time there is to care for sick patients.

A national risk assessment model should be flexible and act as a support, rather than being rigidly prescriptive. At the same time, a national needs risk assessment model be detailed enough to feel worthwhile. Otherwise, there is a risk that the therapists feel the need to use several parallel IT systems, which would increase the administrative burden.

The practitioners believe that a model must simplify and not complicate the work. Data should be retrieved automatically to a much greater extent than today, and you should not have to write the same information in several places. A majority of the participants highlight that today's decision support only includes data from their own the record system and that they do not have access to data from other systems, such as other health data and medical data. It would make it easier to also have access to such data about the patients that are outside the dental record system today - for example, prescribed medicines.

Many demand a high degree of automation, adapted to the patient in question. It would facilitate the work and make the risk assessment time efficient. Some participants also address the possibilities of artificial intelligence (AI), and whether AI can be used in the future to make risk assessments more efficient and equal. The practitioners believe that the purpose of a national risk assessment model must not be to control compensation systems and subsequent measures. It is also important that flexibility is built into a national risk assessment model, so that there is room for professional assessment.

Positive view of a national model, but the purpose needs to be clear

A large majority of the participants from both public and private businesses mainly view a national risk assessment model positively. A few participants with a more skeptical attitude question whether there is any scientific evidence that national risk assessment models benefit patients.

After all, the majority of participants view a national risk assessment model positively. They have nothing against the state deciding on a joint model, as long as the National Board of Health and Welfare and the state work to collect

input knowledge and data from the clinics, allows treating staff and experts to participate in the design and ensures that the model is anchored in science, facts and expertise.

Participants also perceive that a national risk assessment model can be positive from a follow-up perspective. Several of them, both from the public and private sector, see a national risk assessment model as an opportunity to collect data at the national level and follow the development of specific groups or age groups at the community level. In general, the participants are positive about a national model that would make it possible to develop a comprehensive picture of risk assessment nationally and contribute to developed learning.

A number of participants also underline the importance of the risk assessment model continuously developed in line with future needs and societal development. It concerns, for example, factors such as tobacco habits, drug use, psychosocial impact and socioeconomics.

Several participants express a need to clarify why a national model for risk assessment should be introduced and what it should be used for. For example, it was discussed whether the purpose is to be a support on an individual level to be able to decide when the patient should come for a return visit or whether the purpose is to collect data on an overall level in order to gain knowledge about dental care in Sweden in general.

Dental staff want to be involved in developing a model

A majority of the interviewed dentists and dental hygienists emphasize the importance of staff in dental care becoming involved in the process of developing a national risk assessment model. They believe that the competence of the dental treatment staff needs to be utilized in this work in order to be able to successfully introduce the system in the future and get the staff to use it. Dentists and dental hygienists believe that the personnel involved in the work of designing a risk assessment model should be such personnel who carry out risk assessment and who will use the system in the future.

A national risk assessment model requires training

Results from the focus groups show that the introduction of a national risk assessment model requires an information and training effort. Those who will use the model need support and training. It is desirable that all clinics and all treating dental care staff use the model in the same way, so that it contributes to

more equal dental care throughout the country. It therefore makes sense to provide training when introducing a future national risk assessment model.

Risk assessments in the rest of the Nordic region

Within the framework of the mapping, a global analysis of how other Nordic countries view risk assessments in dental care was also carried out.

The Nordic countries have several similarities in their dental care systems. Sweden, Denmark, Norway and Finland, for example, all have a dental care market with a public and a private sector, and all Nordic countries offer free dental care for children and young people [28]. In a European comparison, the countries have a relatively high proportion of the population that visits dental care often [29].

As part of the environmental analysis, the National Board of Health and Welfare invited the Chief Dental Officers of the Nordic countries to a dialogue meeting on risk assessments and audit intervals in dental care. At the dialogue meeting, it emerged that dental care in all countries works with risk assessments. In a literature search for foreign guidelines, guidelines regarding audit intervals and risk assessment were also identified in several of these countries, see the section *Foreign guidelines on risk assessment and audit intervals.*

In Denmark, since 2013, with a minor update in 2016, there are guidelines for determining audit intervals [30]. These guidelines were drawn up as the intervals between return visits to the dental care did not increase in pace with the improvement Danish oral health. It was assessed in Denmark that there was a need for support to introduce need-based audit intervals. The Danish guidelines are based on English guidelines from NICE [1]. They provide support to dental professionals, among other things, through a checklist to assess disease status and risk factors that may affect the future risk of poor oral health. The guideline's recommendation is that the dental staff should weigh together disease status, risk assessment and their own clinical experience to arrive at appropriate treatment and a suitable revision interval between 12 and 24 months.

Norwegian guidelines for children, including recommendations on revision intervals, were published in 2018, with an update from 2022 [31]. In 2019, corresponding guidelines for adults were published [32]. The guidelines specify the ages at which people under the age of 20 should be examined. They also state that the intervals should be a minimum of one and a maximum of two years, and that longer intervals should be avoided at particular ages. The guidelines also provide support in the form of checklists with factors that influence the risk of oral disease, and indicate what should be carried out in examinations of children. The Norwegian guidelines are based on the English [1] and Danish [30] guidelines.

Prerequisites for a national model for risk assessment in dentistry

Even in Finland, dental care works with audit intervals based on risk assessments [33]. Work is underway to produce guidelines for needs-adapted intervals, with planned publication in the first half of 2024. These will include intervals for different ages and support for assessing risk and disease status.

Iceland has not produced its own guidelines, but uses guidelines from Scotland [34] for risk assessment of children. Risk assessment is also used for the possibility of receiving compensation for dental examinations. The Icelandic health insurance does not replace examinations more often than once a year for people who are judged to have a low risk of poor oral health. People with a higher risk, on the other hand, can receive compensation for examinations more often than every six months.

Experiences from when the Danish guidelines

was introduced

When the Danish guidelines were introduced in 2013, they included implementation support with, among other things, checklists for risk assessment and support in evaluating importance of risk factors. The support was used to categorize the patients into three tracks based on diseases of the mouth and risk of such. The green trace means that the patient has no ongoing disease. Green patients may still have risk factors, but these are balanced by healthy factors. The yellow and red tracks are for patients with disease; they are distinguished from each other by whether the patients' risk factors can be influenced by intervention, or
can be influenced only with difficulty or not at all by intervention.
The guidelines were introduced in connection with a new dental care agreement. In an evaluation from 2017 [35], it appears that the caregivers wanted more support for implementation, even though the guidelines did not mean any major change in clinical practice.

In the evaluation of the guidelines, it also appears that approximately 80 percent of the 3.2 million individuals examined between 2015–2017 were placed in a yellow track, despite the fact that there were not that many patients with active dental disease. Reasons why the patients had been categorized as yellow were that gingivitis was interpreted as active disease, and that regional grants for repairs of fillings would not have been paid out if the patient had been categorized as green (absence of disease). The evaluation does not examine the effects of the guidelines on oral health.

Grouping of patients based on historical dental care consumption

Within the framework of its mission, TLV has carried out an analysis of patients' historical dental care consumption. The aim has been to gain an increased understanding of how today's dental care patients could be distributed between different groups,

distributed according to a potential risk assessment. In this chapter, we give an overview of their results. For a deeper analysis and more detailed method description, see TLV's own report *Risk assessment in dentistry: a national model based on historical dental care consumption.*

TLV has investigated the possibility of dividing patients into groups based on dental care consumption over a two-year period. They have started from the assumption that people with more extensive care consumption also initially had an increased risk of poor oral health and thus a greater need for dental care. Patients were divided into four groups (A–D) based on the total number of measures and conditions recorded at their cumulative dental visits over a two-year period beginning with a baseline examination. The grouping means that patients in group A were judged to have had the lowest risk of poor oral health and patients in group D were judged to have had the highest risk of poor oral health, based on the dental care they received over the two years. About all patients had initially been assessed according to a common risk assessment model, they would thus have been able to belong to four different risk groups corresponding to groups A–D.

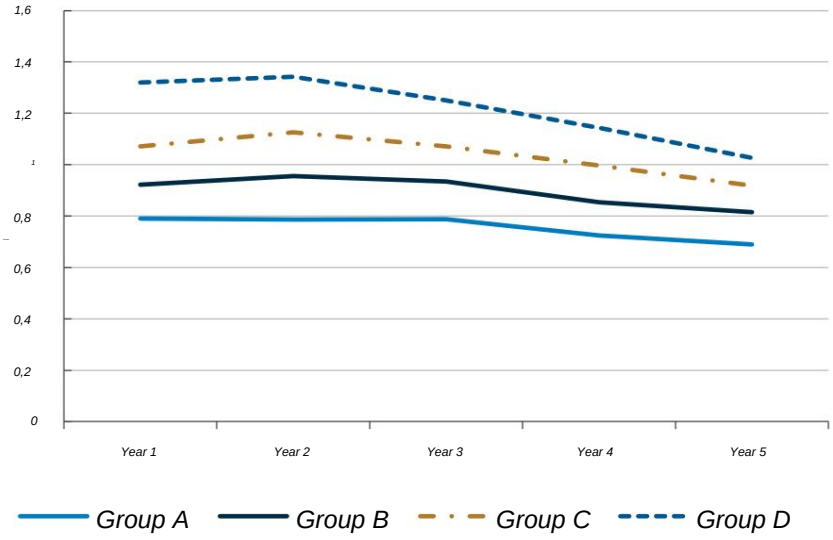
Then TLV tested the outcome of the grouping during a five-year follow-up period (starting two years after each patient's first baseline examination). They reviewed both the number of examinations in dental care, as well as outcomes in the form of the number of teeth that had root canals or were removed. If the grouping corresponded to a categorization into risk groups, groups C and D, i.e. patients who should have been assessed to have had a higher risk of poor oral health, should have more root-filled and extracted teeth than groups A and B.

Figure 8 reports the number of average examinations[48] that the patients in each group received during the five follow-up years. Group B, which is judged to have had roughly the same risk as group A, but received more care during the examination years, on average makes more examination visits during the follow-up period as well. Group C makes even more visits and group D makes the most visits per year. Group D makes the most visits during year two of the follow-up period – an average of 1.34 visits per person.

[48] Basic examinations by dentists and dental hygienists, investigations and urgent examinations, i.e. visits where any of TLV's codes 101, 103, 107, 108, 111, 112, 113, 114 have been registered. Measures other than these may have been carried out during the same visit.

Figure 8. Average number of dental examinations during the follow-up period, divided by group.

Average number of examinations per person for each group.



Source: TLV.

For each patient, the number of teeth that received a root canal49 or were removed was counted remove (extraction) [50] during the period. Wisdom teeth were excluded. About a tooth removed after it was root canaled, only the root canal was counted. The outcome per group was calculated by the average number of teeth per patient that received a root canal or were removed during the follow-up period51 .

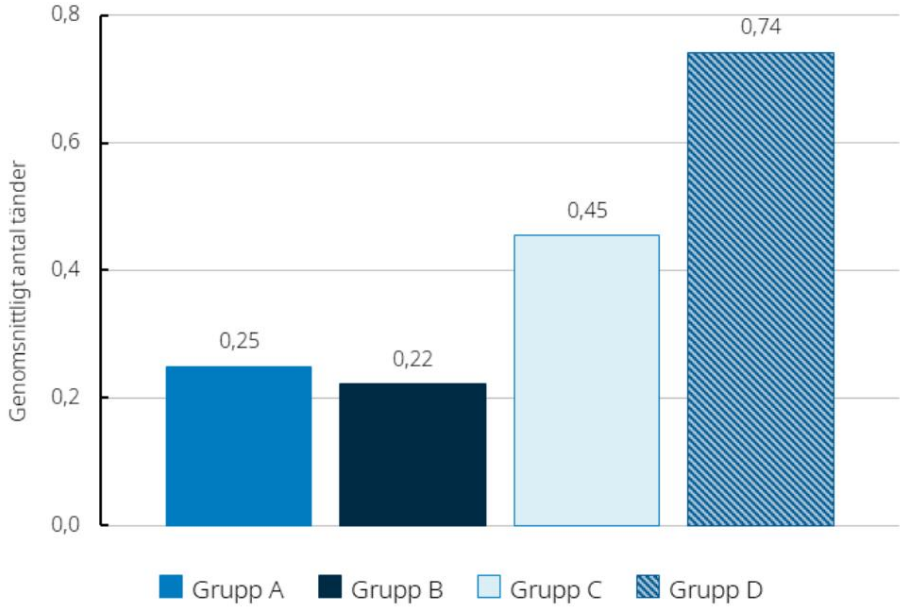
The result of the analysis shows that the average number of teeth per patient that were removed or filled during the follow-up period is higher for groups C and D (0.45 and 0.74, respectively) than for groups A and B (0.25 and 0.22, respectively), see Figure 9. It suggests that the classification of patients into groups based on extent and complexity of care appears to be consistent with outcome calculated over a five-year period. People who received care that indicated they were judged to have been at higher risk of poor oral health had, on average, more root-filled or extracted teeth than people who received care that indicated that

they were judged to have had a lower risk of poor oral health.

[49] TLV action codes 501–504
[50] TLV action codes 401–404
[51] TLV has also included time to first root canal or extraction after the start of the follow-up period as an outcome measure, see TLV's report *Risk assessment in dental care: a national model based on historical care consumption.*

Figure 9. Average number of removed or root-filled teeth per patient during the follow-up period, divided into groups A–D.

Extraction (401-4) or root canal (501-4).



Source: TLV.

In the analysis, conditions and measures are grouped to identify patients at increased risk of future oral health problems by analyzing the health outcome of patients with these reported conditions and measures. The analysis is based on the assumption that patients with already poor oral health are at higher risk of developing further oral health problems. The grouping is based on large amounts of data collected continuously within the framework of the state dental care support52 . The data sets contain information about patients who visited the dental care. They therefore do not capture any oral health problems and needs of people who, for various reasons, do not visit the dentist. Collected data consists of patients' conditions and measures performed by licensed dentists and dental hygienists. This reflects the patients' actual oral health at the time of the baseline examination. The risk of later developing disease in healthy patients is more difficult to assess. A healthy individual will continue to be considered healthy until a new examination confirms different.

[52] Children and young people and patients within the framework of regional dental care are not included.

Prerequisites for developing and introducing a national risk assessment model

In the following chapters, the internal and the surrounding are described conditions that have been investigated by the National Board of Health and Welfare, with the aim of developing and introducing a national model for risk assessment in dental care in Sweden.

Inherent prerequisites

The inherent prerequisites for developing and introducing a national risk assessment model are the scientific support for a national risk assessment model and the possibilities to assess the risk of ill-health in the mouth, as well as the possibilities to be able to document and communicate an assessment of risk. We describe these in the following sections.

Best available knowledge needs further investigation

The best available knowledge, according to science and proven experience, must form the basis of working methods in healthcare and dental care[53] .
Within the framework of this assignment, the National Board of Health and Welfare has begun the work of mapping the research on models for risk assessment in dental care.

There is a lack of scientific support for balanced risk assessment models

At the request of the National Board of Health and Welfare, SBU has examined the scientific support for using balanced risk assessment models in dental care. A focused literature search identified no scientific studies relevant to answering the question, neither systematic reviews nor primary studies. However, it was noted that there are studies that investigated

models intended to assess the risk for individual disease areas, for example caries or periodontitis. It is thus established that there is a lack of scientific studies that evaluate uniform models for a balanced assessment of future risk of ill health in the mouth[54] .

[53] 6 ch. Section 1 of the Patient Safety Act (2010:659)
[54] See Appendix 1 for SBU's full report SBU Prepares.

Scientific support for risk assessment of caries and periodontitis

The scientific basis for so-called prediction models55 that can be used for risk assessment of individual disease states or other conditions in the mouth should be examined, in order to be able to form the basis of a national risk assessment model, given that there is a lack of scientific research on a balanced risk assessment model.

SBU has reviewed scientific studies that have evaluated prediction models for risk assessment of the individual disease conditions caries and periodontitis. The result shows that the scientific basis is not sufficient to assess the reliability of any prediction model for caries or periodontitis. SBU's work may also result in the identification of individual factors whose effect on the risk of developing oral disease may need to be substantiated in the scientific literature. SBU's work can be read in its entirety in their report *Prediction models for caries and periodontitis56 .*

Foreign guidelines on risk assessment and audit intervals

As part of the international environmental analysis, the National Board of Health and Welfare conducted a literature search for guidelines on risk assessment and audit intervals, see appendix 2.

In total, seven guidelines were identified with recommendations or advice with support on risk assessments in dentistry. These have been developed in England [1], Scotland [34], Denmark [30], Norway [31, 32] and Finland [33]. After dialogue with the Nordic countries' Chief Dental Officers, the National Board of Health and Welfare is also aware of ongoing work in Finland with recommendations on examination intervals, which will be published during the first half of the year 2024. In a first step, the National Board of Health and Welfare has identified foreign guidelines that can be quality reviewed at a later stage. Via the expert group that the authority has attached to the task, the National Board of Health and Welfare also knows that there are guidelines for periodontal health from the European Federation of Periodontology from 2017 and later [36-38].

Reflections from the expert group

The expert group associated with the assignment identified a number of risk and health factors that should be taken into account in odontological risk assessment, in the areas of orofacial medicine, periodontology, cariology, orofacial pain/bite physiology and child and adolescent dental care (pedodontics), see appendix 3. There were partly factors within a specific area, partly factors that

[55] A prediction model involves using a number of predetermined variables of importance for disease development which is combined into a risk categorization.

[56] The report can be downloaded from SBU's website.

are common to all these areas. The compilation can be seen as a thought model that should be discussed, anchored, changed and supplemented in continued dialogue with dental expertise to clarify which factors should be included in a risk assessment model.

Many of the modifying factors, i.e. factors that affect oral health, are common to several of the different odontological areas.
They can possibly be classified as risk and health factors for each area.
These need to be further discussed and anchored with odontological expertise.

Examples of modifying factors

- *General illness/ co-morbidity*
- *Medicines (blood thinners, saliva inhibitors, etc.)*
- *Fear of dental care*
- *Lifestyle (alcohol, smoking, diet, etc.)*
- *Social situation (stable/ unstable)*
- *Autonomy (independent/ partially dependent/ dependent)*
- *Economics (good/ less good)*
- *Dental care system (piece price, risk-related financing, fixed financing, necessary dental care, etc.)*
- *Age*
- *Gender*
- *Cognition (good/ less good)*
- *Functional limitation (physical/ mental)*
- *Health priority (high/ low)*
- *Health literacy (good/ less good)*
- *Genetics*
- *Motor (manuel, oral)*
- *Drug abuse*
- *Working conditions that negatively affect, for example, dietary habits*
- *Education level (high/ medium/ low)*
- *Access to dental care (good, less good)*
- *Stress (high/ low)*

Information structure and definitions

A prerequisite for a model to be national is that it looks the same and is used the same throughout the country. Uniform terms, concepts and definitions and adherence to these are required for the model to be uniform, and for it to be possible to document and communicate
the risk assessments. This is a central point in the development of e-health,

thus the possibility of using digital tools to achieve and maintain health.

The National Board of Health and Welfare is one of the authorities that plays a central role in e-health and digitalisation. The authority is responsible for the national technical language within healthcare, i.e. health-related classifications, the term bank and Snomed CT. In 2007, the government decided that Sweden should become a member of Snomed International, an international member-owned organization that owns and manages the clinical term system Snomed CT (Systematized Nomenclature of Medicine Clinical Terms)[57] .

The National Board of Health and Welfare is since then the national release center (NRC) for Snomed CT. In 2015, the regions made a decision in the National Collaboration Group (NSG) for Structured Care Information to introduce Snomed CT as a concept system in the health care system [39]. The National Board of Health and Welfare, on behalf of the WHO, is also responsible for international classifications in Sweden, such as ICD-10 and ICF. A transition from ICD-10 to ICD-11 is currently underway in Sweden.

Dental care's definitions of risk vary

A problem today is that the various risk assessment instruments used in dentistry are based on different knowledge and different weightings of the relative risk. The definition of risk varies. This also applies to the risk assessment modules that are included in the various record systems that are on the market in Sweden today. This results in risk assessment results from different businesses not being able to be collected and compared for purposes such as research and resource allocation, without this leading to systematic, statistical errors.

In addition, there are currently no national standards for medical record system providers to adhere to, although there are proposals to introduce the FHIR standard[58] and Snomed CT. A standardized way of data entry into a national risk assessment model could increase patient safety and trust, as a national model is then built on national or international standards according to relevant laws and regulations.

National Information Structure (NI) – for smooth sharing of information

The National Board of Health and Welfare provides a national information structure (NI), partly a medical terminology in the form of Snomed CT, for use above all in healthcare and social services, but also in dentistry. NI serves as a common reference that describes how information should be structured and expressed in order to be reused within and between different information environments. YOU contribute to information to

[57] Read more about Snomed CT on the National Board of Health and Welfare's website.

[58] Fast Healthcare Interoperability Resources

be able to be interpreted equally and be searched again, and thus to reduce the administrative burden. When the information is structured in an unambiguous way, the risk of the information losing meaning and context is also minimized when it is shared between and within businesses and systems.

Snomed CT – common terms with clear meaning

Snomed CT is an international conceptual system developed for use in electronic information systems. It aims to make the documentation in healthcare uniform, unambiguous and effective.

Content can be easily built and created in Snomed CT's concept system. It is possible to create new terms and synonyms for national or international use. These can be introduced in a multiprofessional care environment, that is, between different specialist areas, clinics, hospitals and care providers. This enables semantic interoperability, simply put that different systems and businesses understand each other correctly. Various actors in health care and dental care can thus exchange information. So-called mapping of codes between classifications and Snomed CT makes it possible for new record systems to handle the information from old record systems.
There is currently a collaboration between the World Health Organization (WHO) and Snomed International on mapping between the International Classification of Diseases (ICD) version 11 and Snomed CT.

Increased semantic interoperability – allowing systems to communicate seamlessly

The National Board of Health and Welfare is tasked with creating an appropriate information structure (NI) as well as uniform concepts, terms and classifications59. The authority therefore provides tools that create conditions for increased semantic interoperability60 in the digital information management.
Joint information management is central if health information is to be shared with other countries, for example within the EU via the European Health Data Space (EHDS) [40, 41]61 .

The terms in Snomed CT can also be used for documentation in the health care information system to provide better conditions for comparing health data. Snomed CT is used internationally for information storage and transfer between different specialist areas.
For example, the healthcare system's information about a patient could

[59] See 4 § 9 of the regulation (2015:284) with instructions for the National Board of Health and Welfare.

[60] Semantic interoperability means that the information must be interpreted in the same way by both the documenter and the recipient of the information, regardless of which terms and structures are used in different IT systems or in different businesses.

[61] Therefore, the EU is willing to contribute 60 percent of the membership fee to Snomed International for the countries within the EU that want to be members of the organization.

be used in risk assessments in dentistry, because the content of Snomed CT is context-based, comprehensive and rich in detail. It may contain, for example, anamnestic information, clinical examination findings and measures from the patient's visit to a hospital or clinic. Snomed CT also contains concepts that cover social factors in the patient, for example lifestyle habits. With the help of such a concept system, the information about the patient can be documented in the medical record with the desired level of detail.

Information specifications for structured documentation

The National Board of Health and Welfare already has an elaborate working method for creating information specifications to structure and standardize how clinical information should be documented in health care. Dentistry could apply a similar process, with structured and standardized risk assessment. It can be identified, defined and modeled information to be structured in the following steps:

1. ***Analysis of the risk assessment process:*** *identify and describe all steps in the process and which actors are involved. This step requires business-related competence and should be carried out in consultation with business representatives.*
2. ***Concept investigation and concept analysis:*** *The connection to The specialist language of the operations is central to the further development in order to ensure that different businesses mean the same thing when they documents the process and outcome.*
3. ***Legal investigation:*** *For each concept area, a legal investigation is also carried out, which means a review of the documentation requirements that belong to the area. The investigation aims to identify explicit legal requirements (must-requirements) in the constitution for documentation and reporting.*
4. ***The modeling of information*** *is carried out in parallel with the investigations. The investigations result in a process model, conceptual model and information model[62]*
5. ***Terminology binding:*** *development of codes to be used for the various attributes in the information model. The information model contains a number of information classes which in turn contain a number of attributes. An information model contains information classes, for example a person which in turn contains the attributes person-id, first name, last name and more.*

The information to be structured needs to be delimited according to the best available knowledge or proven experience, as well as in accordance with

[62] Read more about the reference models of the national information structure

care processes for dental care, guidelines, regulations and regulations governing dental care.

In order to develop information models that are adapted to dental care, the current process must be thoroughly studied. It concerns
for example, which information should be entered, how it should be used and analyzed. It is important that the components are structured and appropriate and are based
on uniform concepts, terms, classification and that they are managed nationally.

Long-term management of information specifications requires close cooperation between dental care, research and the management organization, as the knowledge within each activity is continuously developed.
The advantage of building these information specifications on national standards is that they can be managed as part of a digital strategy. Desirable standards are, for example, those described above – national information structure (NI) and the nationally recommended reference medical terminology Snomed CT.

Standardization allows better follow-ups and better patient safety

A national model for risk assessment, with nationally accepted terms and definitions, enables quality assurance of dental care operations.
This can be done through regular follow-ups of identified and well-developed quality indicators linked to dental care's activities within risk assessment. However, it assumes that there are national standards that govern dental care. Parallels can be drawn to other medical activities where this already occurs. An example is the Individual patient overview (IPÖ) in cancer care, which makes it possible to collect and visualize

information about the individual patient's care and treatment. The information can also be used to develop care, in research and as a basis for decisions to promote equal care.

The information that is entered into the dental care systems, and used as a basis for risk assessments, needs to be unambiguous, credible and of high quality so that it can also be used as a basis for national processing of data by authorities and organisations. In this way, the opportunities to work with knowledge development, resourcing and research in dental care are supported.

By standardizing the risk assessment process nationally, the risks of incorrect or non-normalized interpretations of assessments of different systems are reduced. It also contributes to more equal dental care for residents across the country.

Ambient conditions

The National Board of Health and Welfare has identified three relevant surrounding conditions: data flows, central legal aspects and health economic aspects. We describe these in the following sections.

Data flows between dental care and agencies

In order to be able to evaluate a possible national model for risk assessment, you already need to have in mind how to collect and take care of data when designing the model. Today collects Försäkringskassan enters data from dental care for reimbursable measures within the state dental care support. A care provider who is connected to the state dental care support is obliged to assess whether a dental treatment entitles to compensation, and to report all dental care that is eligible for compensation to the Social Insurance Agency. Försäkringskassan forwards certain data to the National Board of Health and Welfare, TLV and Statistics Sweden (SCB).

Many data that are registered within the framework of the state dental care support are passed on from the Social Insurance Agency to the National Board of Health and Welfare's dental health register, with the support of § 15 and § 21 of the regulation (2008:193) on state dental care support. The register contains information about dental care within the state dental care support, dental care for people with certain long-term illnesses and functional impairments and necessary dental care.

De-identified information about the patient, care provider, reception and case is sent to TLV in tabular format. The data applies to registered visits, registered measures performed and registered patients with subscription dental care. The data transfer takes place with the support of § 19 a of the regulation (2008:193) on state dental care support, which describes the Swedish Social Insurance Agency's obligation to provide information to TLV for data registered within the framework of the state dental care support. Statistics Sweden receives the same information as TLV (except Tandpriskollen), but with the difference that Statistics Sweden receives identifiable data for patients, care providers, receptions and cases.

Prerequisites for developing the dental health register

One of the aspects that needs to be taken into account when it comes to how a national model for risk assessment in dental care should be designed is the prerequisites for entering new data into the dental health register.
The dental health register is one of the National Board of Health and Welfare's health data registers. It is surrounded by a complex and comprehensive legal regulation of both the collection and handling of data.

Provisions on personal data processing and obligation to provide information to the National Board of Health and Welfare's dental health register can be found, among other things, in the Act (1998:543) on health data registers and the regulation (2008:194) on dental health registers at the National Board of Health and Welfare.

The dental health register receives its information from the Social Insurance Agency, which provides information on dental health and performed dental care within the state dental care support as well as information on dental health and certain dental care performed within the part of dental care that is included in regionally funded dental care for the health care fee.

The care provider's obligation to submit information to the National Board of Health and Social Welfare and the Social Insurance Agency about dental health and performed dental care within the state dental care support is regulated in ch. 3. Section 3 of the act on state dental care support. For information about dental health and performed dental care within certain regionally funded dental care, the regulation of the care provider's obligation to provide information can be found instead in the Dental Care Act (1985:125) and the Dental Care Ordinance (1998:1338).

Constitutional amendments would be required to expand the data collection for the dental health register, with the aim of nationally following up the risk assessments of healthcare providers.
It therefore needs to be investigated in a special order. Among other things, it needs to be ensured that a possible extension of the obligation to provide information is compatible with the provisions on the protection of personal integrity when processing personal data.

Legal starting points

The National Board of Health and Welfare reports in this section some legal starting points on an overall level. Depending on how the model is designed, further investigation of the conditions needs to be done. It is about the legal prerequisites for healthcare providers to enter and document information that is not in current decision support, above all social factors, in a national risk assessment model. It is also about these care providers to an increased extent being able to collaborate and share information from other care providers in dental care, health care and social services in order to use in a risk assessment model. In order to create such conditions, it may be necessary to implement constitutional changes in existing regulations at the level of laws, regulations or regulations. This could, for example, apply to rules on documentation and on personal data processing, e.g. documentation of clearly defined and appropriate social factors that can be used in a risk assessment model, as well as on confidentiality.

Cooperation between dental care and healthcare and social services

Oral health is part of general health. It can affect, or be affected by, various factors linked to other activities. These businesses can

exist in care, health care and social services. For example, a person with a failing ability to self-care may need help with brushing their teeth to maintain their oral health, and a person whose oral health problems lead to difficulty eating may need special support from a dietician.

In the national guidelines for dental care [18], it is also emphasized that dental care should work to be part of the care chain around patients who receive care from several agencies.

The rules on confidentiality and non-disclosure can be an obstacle to collaboration around individuals. Within both health care and social services, the starting point is that strong confidentiality63 applies to information about individuals' personal circumstances. This means that, as a rule, a confidentiality assessment needs to be carried out in each individual case before information can be shared between health care, dental care and social services. There are then limited opportunities for them to share information. An example of a non-confidential provision is if the individual consents to the disclosure of the information64 .

One way to be able to share information is through coherent health care documentation65. According to the Act (2022:913) on coherent care and care documentation, care providers66 and care providers67 may, under certain special conditions, make available and share each other's information through direct access or other electronic disclosure through an electronic system. A coherent care and care documentation has the primary purpose of improving and simplifying communication between different care givers and care givers, and thereby improving the care of and interventions for the individual68 . It is voluntary for care givers and care givers to join a system with coherent care and care documentation69 . Within social services, however, coherent care and social care documentation may today only be applied within the parts of

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[63] According to ch. 25 § 1 and ch. 26 Section 1 of the Publicity and Confidentiality Act (2009:400), OSL, applies a presumption of confidentiality. For private care providers, there are rules on confidentiality in ch. 6. Sections 12–16 of the Patient Safety Act (2010:659), PSL, and for individual activities within social services there are regulations in ch. 15. §§ 1 and 2 of the Social Services Act (2001:453), SoL.

[64] See ch. 10. § 1 OSL. Further examples of confidentiality-breaking regulations can be found in ch. 25. Section 12 and 26 ch. § 9 OSL.

[65] In ch. 25 § 2 and ch. 26 § 1 a OSL there are regulations on confidentiality in the case of integrated care and care documentation.

[66] The term care provider refers to ch. 1. Section 1 of the Act on Integrated Care and care documentation government authority, region and municipality in the matter of such health care for which the authority, region or municipality has responsibility as well as another legal person or sole trader who provides health care.

[67] The term care giver refers to ch. 1. Section 1 of the Act on integrated care and social care documentation authority in a municipality or region that is responsible for or performs interventions for elderly people or persons with functional disabilities as well as other legal entities or sole proprietors who perform such interventions.

[68] It is prop. s. 94.

[69] See prop. 2021/22:177 pp. 44 and 193.

the activities of the social service which relate to the care of elderly people and people with disabilities[70] .

Regulations for record systems and medical devices Some of the dental care record systems are classified as medical devices. There are different regulations for record keeping in healthcare and dental care and for medical devices. It appears from ch. 1. § in the Patient Data Act (2008:355) that the law must be applied to healthcare providers' processing of personal data within healthcare. The law also contains provisions on the obligation to keep patient records. The purpose of keeping a patient record is primarily to contribute to good and safe care of the patient, as is apparent from chapter 3 § 2 of the Patient Data Act (2008:355). In the National Board of Health and Welfare's regulations and general advice (HSLF-FS 2016:40) on record-keeping and processing of personal data in the health and medical care, there are regulations on information management in record-keeping in the health and medical care. A record system is a tool with the possibility of storing patients' personal and health data.

The definition of medical device appears in the EU regulation 2017/745 on medical devices (MDR). Medical devices encompass a wide variety of products, from simple consumables to complex high-tech equipment and software programs.

The definition of medical device appears in the EU regulation 2017/745 on medical devices (MDR). The medical technology legislation is product safety legislation. EU law forms the basis of the regulatory framework, which aims to ensure that the products placed on the market are safe and suitable for their intended use.
The National Board of Health and Welfare's regulations (HSLF-FS 2021:52) on the use of medical technology products in health care must be applied in activities covered by the Health Care Act (2017:30) and the Dental Care Act (1985:125). The product's properties and what it is intended for determine whether it is a medical device or not. The intended use is evident from the labelling, instructions for use and marketing.
It is the Swedish Medicines Agency that has supervisory responsibility for whether Swedish suppliers of medical devices live up to the new EU regulation MDR. A software can qualify as a medical device if the manufacturer's stated purpose for the software matches the definition in § 2.

It is unclear whether there is any legal significance if the healthcare provider documents patient information from a risk assessment in a medical record system

[70] See ch. 1 § 1 and ch. 2 Section 1 of the Act on integrated care and social care documentation.

which is classified as a medical device or not. This should be examined in particular if a national model for risk assessment is to be developed.

Social factors

Our survey has shown that practitioners feel that current decision support for risk assessment does not include such social factors that can facilitate the practitioner to correctly assess patients' risk of poor oral health. This applies above all to children's social conditions. The National Board of Health and Welfare assesses that it may be necessary to amend the constitution to enable a healthcare provider to document and enter clearly defined information in the record about social factors that concern a patient and that are needed in and for the care of the patient. In the work on possible constitutional amendments, it must be clarified whether the documentation of such data on social factors is compatible with the provisions on the protection of personal integrity when processing personal data in above all the data protection regulation. The regulation requires, among other things, that it must be adequate, relevant and not too extensive data that is processed for certain specifically stated purposes (see article 5 of the regulation). An integrity analysis will need to be carried out to assess whether the consequences for personal integrity that the processing of personal data entails are necessary and proportionate in relation to what is intended to be achieved with the processing.

Ethical principles for prioritization

In healthcare, three basic ethical principles are used as a starting point when prioritizing how to use public resources.
These principles are part of the so-called ethical platform, which was drawn up through the government inquiry *Vårdens svöra val* (SOU 1995:5).
The principles were incorporated into the Health and Medical Care Act in 1997 and since then govern how health and medical care resources within publicly funded care are to be distributed.

Below is a brief description of each principle.

- ***The human value principle*** *emphasizes that each individual has intrinsic worth and the right to respect and dignity regardless of health, age, gender or other factors. The equal value and integrity of patients must be preserved and respected. Prioritization must therefore not be done based on patients' gender, chronological age, ability to work and so on.*
- ***The need-solidarity principle*** *emphasizes the importance of meeting the health care need. The principle means that health care resources must be invested in the patients who have the greatest need. According to the principle, special consideration must be given to the needs of weak groups and groups that find it difficult to make their voices heard.* •
- ***The cost-effectiveness principle*** *means that the resources in health and medical care should be used in an efficient way in order to*

> *maximize the results and benefits for the patients, and to economize on the limited resources of the healthcare system.*

In the investigation, it appears that the principles are arranged so that the human value principle is most important, then the needs-solidarity principle and lastly the cost-effectiveness principle. In daily practice, this means that treatments for serious conditions may cost more in relation to their effect than treatments for conditions that are less serious.

However, dental care is not covered by this platform. Dental care was discussed in the investigation but was deliberately left out. The principles are also not enshrined in the Dental Care Act, and there is therefore no requirement that dental care must follow these principles. But with several actors there is a goal to apply the ethical platform also in dental care. For example, the National Board of Health and Welfare starts from the ethical platform when the authority produces national guidelines for dental care, and many regions strive to prioritize their resources in accordance with these principles. The National Board of Health and Welfare was positive to a proposal in the state investigation *When the need must rule - a dental care system for a more equal dental health* (SOU 2021:8) to introduce the ethical principles also in dental care.

Health economic aspects

The last environmental aspect that the National Board of Health and Welfare examined is about health economics. According to the government mandate, the authority must report cost calculations for any proposed interventions, but as the National Board of Health and Welfare's report does not include any concrete proposals on how a model for risk assessment should be designed, and thus we do not report any such cost calculation either.

The government mandate also states that any proposals must be expedient and cost-effective, fit within existing financial frameworks and not entail increased costs within the framework of the general dental care allowance or for the state dental care support in general. Against this background, the National Board of Health and Welfare has commissioned health economists from Linköping University to reason about the possible consequences of introducing a national model for risk assessment with current state dental care support. That assignment is reported in its entirety in Appendix 4. The reasoning of the health economists

highlights the importance of conducting thorough analyzes of the health economic consequences in parallel with the development of a national model for risk assessment.

At the beginning of the report, it is stated that today's remuneration system with ATB risks leading to certain individuals visiting dental care for basic examination earlier than they need, so that the grant is not lost. Furthermore, it is stated that ATB is not need-based but is given equally

everyone, based on age. Since the grant is the same for everyone regardless of need, the reimbursement model conflicts with the need-solidarity principle, which states that priorities should be given to those with the greatest need. Furthermore, it conflicts with the principle of human dignity because certain age groups are favored through higher contributions. See also the section *Ethical principles for prioritization.* Against this background, a health economic reasoning is carried out based on hypothetical scenarios. These are based on a redistribution of resources within the framework of the current state dental care support, including ATB.

One scenario is based on an improved risk adjustment being introduced, with the effect that patients visit the dental care for a basic examination in accordance with the national guidelines. That scenario would lead to dental care using their resources more efficiently. In the long term, it should also result in lower costs, with possibly increased short-term costs. More individuals at high risk would be identified and receive preventive measures. At the same time, one would identify more low-risk individuals and avoid giving them unnecessary measures.

In this and several other scenarios that mean that the current system with ATB would change, the changes could lead to a redistribution of resources. The report discusses the possibility of redistributing the money used to the high-cost cover, without the state's total cost of dental care increasing. Assuming that dental care makes correct risk assessments, it would be possible to re-prioritize resources to individuals with great needs and high costs. The health economists are also discussing a possible investment in measures for disease prevention and cause-oriented treatment.

The National Board of Health and Welfare can state that it is important to take into account who consequences that the compensation system's design can have for patients and practitioners, and that a national risk assessment model can be a tool to achieve more efficient resource management in dental care. An incentive analysis to study in which direction the actors can be expected to act based on the current situation or in the event of a hypothetical change in government support may be important to carry out. Furthermore, the health outcome needs to be evaluated so that the cost-effectiveness can be calculated.

Proposal for the design of the model

In the following section, the National Board of Health and Welfare describes aspects to take into account, and keep in mind, if and when a national model for risk assessment is to be designed. A national model can be designed and introduced in stages, whereupon different aspects could become relevant at different times.

A risk assessment model must take special account of certain patient groups

Certain groups have an increased risk of poor oral health. It can be about

- people with impaired general health
- people with disabilities that affect the ability to care about your own oral health
- people with unhealthy lifestyles
- children with unhealthy lifestyle habits in the family
- children with teeth that are about to erupt
- elderly patients with an increasing risk of deteriorating health
- patients who take certain medicines which, for example, cause dry mouth and appetite fluctuations.

The mapping of risk assessments and decision support for risk assessment shows that dental care takes into account general aspects that increase patients' risk of poor oral health. All modules in the medical record systems contain factors about patients' general health or ill-health. The free-text answers in the survey also show that the businesses take into account a number of external factors that affect oral health, for example drugs that can cause dry mouth or diseases that affect oral health, for example diabetes.

For children and the elderly, it may be especially important to take social factors into account, as these are stages in life when the environment often plays a greater role in health and oral health. Children depend on their environment to create and maintain good habits. Children's oral health is therefore affected to a greater extent by the child's social situation, including the financial situation. Individuals in need of special support, for example the frail elderly, also depend to a greater extent than others on their surroundings to maintain good oral hygiene and oral health. In the following section we explain
for the oral health of children and the elderly and individuals in need of special support.

Children's oral health needs attention

Dental care needs to pay particular attention to children's oral health, as it is the basis for future oral health or ill-health as well as the future need for dental care. Caries is one of the most common diseases in children.
Newly erupted teeth are more susceptible to developing caries, and it is at this age that habits are established around tooth brushing and eating habits.
Bad habits can be hard to break in the future, and children depend on their guardians' habits. A child who has developed caries early in life runs the risk of having continued caries attacks throughout his life with subsequent poor oral health and the need for dental care. Therefore, it is important to identify early the children who are at risk of caries and to implement preventive measures, before the first damage to the teeth has occurred.

It is a challenge for dental care to identify the children who are at risk of developing caries before the first caries lesions have appeared. It shows
The National Board of Health and Welfare's analysis [13] of the development of oral health among children of preschool age. This applies especially to the youngest children, who are difficult to examine and where bad habits have not yet led to any injuries. Even a systematic overview from the SBU [42] has stated that it is difficult for dental care to identify individuals who are at risk of caries before the first caries lesions appear.

As previously mentioned, knowledge of children's social and economic conditions is important to be able to assess their risk of developing dental caries. It is described as a complex interplay where eating habits, oral hygiene, the family's other health traditions, level of education and financial situation come into play [43]. Country of birth, education and income are three factors that have a clear connection with children's risk of developing caries at an early age (3–6 years) [13]. Parents' oral health and dental contact are also associated with an increased risk [13], and placed[71] children often have worse oral health than other children [44]. The National Board of Health and Welfare's analysis [13] has shown that it seems to be mainly odontological rather than social factors that underlie the frequency of examinations in children's dental care.

The focus groups show that dental treatment staff feel that there is a lack of support for handling children in a good way in current risk assessment modules. They lack relevant social factors, for example alternating accommodation for children, need for care interventions at home or siblings with caries. Norway, Scotland, Finland and Iceland today differentiate between risk assessment of children and adults.

In addition to disease treatment, children's dental care also includes treatment of unwanted conditions, growth and various complications, for example after dental trauma. Dental care's collaboration with other actors, such as

[71] placed in family homes or homes for care or accommodation.

child health care, is an important part of identifying children who are at risk of developing ill-health in order to be able to put in preventive and health-promoting efforts early on. Dental care is part of the national health program for children and young people that the National Board of Health and Welfare has been tasked with developing. The goal of the program is for children and young people to have easier access to the interventions they need in order to have good conditions to create, maintain and improve their health.

Elderly and individuals in need of special support

In general, the number of remaining teeth increases in people aged 70 and older. At the same time, many of the teeth are damaged or filled, which increases the need for regular basic examinations. 70–84-year-olds are also the ones who visit the dentist most often. As with other patient groups, there are differences in the oral health of the elderly depending on socio-economic factors such as level of education and country of birth. It means a challenge for dental care, healthcare and care that the proportion of elderly people over 80 is growing, because frailty and functional impairment affect the ability to maintain good oral health.

People with dementia, which are expected to increase with an aging population, may be in need of interventions from dental care, for example due to dry mouth or poor dental status. The National Board of Health and Welfare therefore recommends diagnostics of oral health and eating problems with structured assessment instruments, for people with dementia [45]. In order to meet the increased needs for treatment, above all for the frail elderly and elderly with special needs, dental care needs to cooperate with the other health and medical care (among others the municipal) and with social services (that is, the municipal care) [18] .

When and if a national model for risk assessment is to be developed, special consideration needs to be given to individuals in need of special support to maintain good habits and good oral health, for example some frail elderly people. There is reason to further investigate how a national model can be adapted to the target groups for the dental care support that is currently regulated in the dental care regulation and the government's special dental care grant. These patients often need adapted dental care and support from several different actors within the health care system and may have interventions from social services, such as elderly care. There are also several target groups with special needs who are not covered by dental care support according to the dental care regulation or the special dental care allowance, but who have no contact with dental care. In the work to develop a national model for risk assessment, special consideration needs to be given to these individuals to ensure that their needs can be captured by the model. One way to capture individuals who have several different contacts in health and care can be to exchange information, but today's regulations are sometimes an obstacle, see the section *Cooperation between dental care and health care and social services.*

The patient should be involved in the risk assessment

Patients' self-care is central to promoting oral health and preventing disease. In the national guidelines, it is stated that everyone who visits dental care should receive health-promoting and disease-preventing feedback in order to be able to take responsibility for their oral health in the best possible way. For people with good oral health, a brief feedback as part of an examination is sufficient.
People with unhealthy lifestyles, on the other hand, may need more feedback in the form of professional conversational support. It is important that the support given is adapted to the patient's ability to absorb, understand and apply the advice, and that there are no unnecessary structural obstacles to giving or receiving support for self-care.

The patients also need to be involved in the risk assessments, according to the national guidelines for dental care. The dental staff should, together with the patients, investigate the causes of discovered risks and injuries in the mouth.
In order for a longer revision interval for low-risk patients to become relevant, the patient also needs to perceive his or her oral health as good or very good. If necessary, the dental care can keep in touch with the patient between the basic examinations through digital reconciliations or visits to the dental hygienist; this may be particularly justified when audit intervals are longer.
The National Board of Health and Welfare's mapping has shown that some dental clinics already work according to that way of working.

A survey carried out by Vårdanalys [46] shows that many patients request more information about their dental care and treatment. Both digital, oral and written information is requested. The need for information is greater among younger patients with a lower level of education and people with a greater need for dental care. Among patients who rate their dental health as poor, less than half answered that they have received enough information.

A national model for risk assessment could support the therapist in communicating with the patient. The National Board of Health and Welfare's mapping shows that the decision supports for risk assessments that exist today are often used for this purpose. A national model for risk assessment that contributes to the patient receiving easily accessible information about the risk of deteriorating oral health, and that indicates reasons for an increased risk, can provide incentives for a positive dialogue with the practitioner. Such a dialogue can be about the possibilities for the patient to reduce the risk of oral health problems on their own or together with dental care. The dialogue can be about the different clinical interventions that dentistry can provide, but also suggestions for changes in self-care and lifestyle. The model could also include an opportunity to include the patient's evaluation of their oral health, self-assessed risk of developing oral health problems and prioritizing oral health.
Dental care needs to adapt the information to the individual's ability to

understand, value and use it. A national model for risk assessment could thereby contribute to strengthening the patient's role in dental care.

An increased opportunity for patients to be involved in the risk assessment process could lead to a general increase in the knowledge of dental care patients about oral health, causes of oral diseases and the factors that can affect oral health.

It is important that dental care collaborates with other actors around individuals who depend to a greater extent on their surroundings for self-care and good habits. As stated in the national guidelines for dental care [18] should dental care work to be part of the care chain around patients who receive care from several agencies. A national model for risk assessment could provide support for dental care's cooperation with other actors around the patient.

The construction depends on the purpose

A national model for risk assessment can, similar to current decision support, be constructed in different ways, depending on what purpose you want to achieve with the risk assessment. In its most stripped-down form, a model for risk assessment can consist of a simple decision support where the practitioner is only reminded to consider a number of factors; in order to construct such a model, decisions need to be made about which factors should be included in the model. A more complex, but perhaps also more expedient, model could involve categorizing patients into risk groups. The risk grouping can take place for respective factor, or to a combined risk group where the various factors, or their constituent values, are weighted against each other. In order to develop a more complex model, decisions need to be made

- which metrics should be included in each factor
- number of risk groups and definition of which limit values shall apply between the risk groupings
- how the respective constituent factors or their measurement values should be weighted against each other to give a balanced risk group.

The therapist needs to be able to adjust the risk assessment

The National Board of Health and Welfare's mapping shows a clear consensus that the therapist needs to be able to influence the patient's final risk assessment, and if necessary also risk grouping. Business managers, practitioners and business representatives in dental care all emphasize that the licensed dental care staff need to have the opportunity to supplement a proposed risk from a decision support – regardless of how it is designed – with their clinical competence and knowledge of the patient. In the national guidelines for dental care, it is also stated that the practitioner always needs to do a clinical

risk assessment even if he uses a decision support. Administrators of current risk assessment modules emphasize that they function precisely as support for decisions, and that the risk group that may be calculated is a proposal for the processor. Furthermore, they emphasize that the decision support is designed to fit the majority of a population based on a normal distribution curve. For patients at the extremes of such a curve, it is more likely that the practitioner will need to adjust the outcome of the risk assessment.

The decision support should be able to be included in the record systems so as not to increase the administrative burden

A prerequisite for not increasing the administrative burden for practitioners in dental care is that a national model for risk assessment can be integrated into the record systems. The majority of decision supports for risk assessment in use today are integrated into medical record systems, which lowers the threshold for integrating a national model there. The dentists also emphasize that it is important that they do not need to use several different IT systems. They desire a high degree of automation of the input of data into a risk assessment model. To increase the possibilities for such automation, today or in the future, the model should therefore be able to be integrated into the medical record systems. Data from other parts of the records system - or from other sources - could then be transferred to the risk assessment, to avoid duplication of work.

A plan for evaluation is important

A plan for evaluation needs to be drawn up in connection with a national model for risk assessment being designed and introduced. The National Board of Health and Welfare's mapping has shown that evaluations have been important during implementation when other decision support for risk assessment has been introduced, both in Sweden and Denmark. There may be different ways to evaluate a national model for risk assessment, but the first step should be to evaluate how dental care has introduced and started to use the model. Validity and reliability are central evaluation criteria for measuring the reliability of the model. When developing the model, one should investigate what data is necessary and whether current data flows can be used, or if there are more efficient possibilities for data flows.

The management structure will be decisive for how the model can be evaluated and further developed. To make it possible to continuously share experiences and make analyses, the model should be managed in close cooperation with the users. In order for a national model to remain correct and useful over time, it should also be connected to areas of development in dental care, for example the development of different care processes. That need speaks

also because a national model should be managed in close collaboration with the users.

A national model for risk assessment needs to be able to be updated when necessary, for example with new research or in the event of major societal changes, in order to function well as a support for therapists over time. It is important that evaluations follow both how a national risk assessment model is used, and the health outcome of the population.

In connection with a model being developed and introduced, the dental health register can be developed. However, this would require constitutional amendments. In such a process, consideration should be given to which data are of value in evaluating a national risk assessment model, including based on health outcomes. The health outcome is also important to be able to evaluate the cost-effectiveness of a model.

Several authorities and actors need to be involved

Several authorities and actors need to be involved if a national model for risk assessment in dental care is to be developed and introduced. Central authorities are TLV, SBU and Försäkringskassan, but developing and introducing a uniform information structure for a national risk assessment model may mean that several actors become involved. It is also important that organizations close to operations are included early on.

NI and Snomed CT are currently managed by the National Board of Health and Welfare, as part of the agency's instructions on e-health and interoperability. There are also other national IT components. For example, developing The authority for digital administration (Digg) the digital infrastructure for information exchange, and the E-health authority develops the National Medicines List. There could thus be several national actors who could become involved in a national model for risk assessment in dental care, even if the National Board of Health and Welfare would have primary responsibility for the model's information structure.

Both public and private health care providers would be recipients of a standardized information specification for a national risk assessment model. Such work requires dialogue, cooperation and close cooperation between the respective specialist associations in dental care, providers who provide the record systems, the regions, regional structures for knowledge management, private healthcare providers, quality registers and relevant authorities. The more stakeholders that are involved in the development and work of producing an information specification for a national risk assessment model, the better the inclination to receive, introduce and use the model.

Prerequisites for a national model for risk assessment in dentistry

The National Board of Health and Welfare's mapping shows that X-ray examinations are used to assess patients' risk of diseases, conditions and injuries in the mouth. The radiation protection regulations: Radiation Protection Act (2018:396), Radiation Protection Ordinance (2018:506) and the Radiation Safety Authority's regulations[72] require that the use of ionizing radiation is justified and that the radiation protection is optimized. From a radiation protection point of view, it is therefore important that a national model for risk assessment takes radiation protection aspects into account when making any recommendations about X-ray examinations in a model.

[72] SSMFS 2018:1 The Radiation Safety Authority's regulations on basic provisions for permit-required activities with ionizing radiation, SSMFS 2018:2 The Radiation Safety Authority's regulations on notifiable activities and SSMFS 2018:5 The Radiation Safety Authority's regulations and general advice on medical exposures.

Balanced assessment and plan for continued work

In this chapter, the National Board of Health and Welfare makes a balanced assessment of the results that have emerged and our central observations about the conditions for the introduction of a national model for risk assessment in dental care. In conclusion, we present a plan for continued work on developing a national model for risk assessment.

Balanced assessment

The National Board of Health and Welfare assesses the conditions for introducing a national model for risk assessment in dental care in Sweden as good, seen from an operational perspective. Risk assessments are an established way of working in dentistry, and many businesses today apply different decision supports, with different designs and complexity, to help with risk assessments. The mapping has shown that no current decision support has been scientifically validated.

Depending on how the model is designed, further investigation of the conditions needs to be done. As explained in the section *Legal starting points,* constitutional changes may be required in existing regulations at the level of law, regulation or regulation depending on how a national model is designed. This could, for example, apply to rules on documentation and on personal data processing, for example documentation of clearly defined and appropriate social factors that can be used in a risk assessment model, as well as on confidentiality. It can also be about the conditions for introducing new factors that are not in current decision support, above all social factors, into a national risk assessment model.

Furthermore, the limited scientific support for risk assessment models in dentistry needs to be taken into account. It is difficult to assess with good reliability the effect of a risk assessment model because it has not been possible to compile a scientific basis for balanced risk assessment models in dentistry. It will therefore, among other things, require special methods to determine the best available knowledge for a model. There are also experiences to learn from the care providers who have worked with more complex decision support.

The expert group that the authority has attached to the task in question believes that a national model for risk assessment can be a valuable tool for individually adapting preventive efforts, treatment and revision intervals.

The National Board of Health and Welfare also assesses that a national model for risk assessment does not

should be so simplistic as to be irrelevant, but not so complicated either to fill out and use that this takes time away from caring for the patient.

Overall, the National Board of Health and Welfare assesses that a national model for risk assessment should be developed for the entire population. However, the special situation of certain groups, such as children and people with special needs for support, needs to be taken into account. However, a model could be introduced in stages, and include parts of the population in different stages. The end goal is not that a national model for risk assessment in dental care is in place, but that it is used and leads to the desired results, ultimately better oral health and increased equality in dental care.

A national model for risk assessment provides the conditions for more equal dental care

A national model for risk assessment can contribute to more equal dental care by allowing the practitioners to start from a common model when assessing patients' risk of developing or worsening diseases, conditions and injuries in the mouth. This would mean that all patients are assessed according to the same criteria regarding the risk of developing oral health problems, regardless of the choice of care provider or geographic residence.

A national model for risk assessment can thus strengthen the dental care's ability to work more cause-oriented and preventively and to identify and prioritize patients with greater care needs. At the same time, the patient's role in dental care can be strengthened, in such a way that a national model for risk assessment can be a tool for involving the patient in the risk assessment process.

When a national model is in place, the National Board of Health and Welfare should update the national guidelines for dental care, with associated revision intervals, updated with a recommendation that the risk assessment should take place according to the national model, which provides additional conditions for more equal dental care.

Better conditions for research and knowledge development in dentistry

A national model for risk assessment would strengthen the possibilities for research and knowledge development in dentistry. A model that includes the entire population would enable studies of oral health over a long period of time and registry studies of risk factors in different groups in the population. A national model for risk assessment would also lead to improved opportunities to compare regional differences in care needs and treatment of different groups in the population. A model based on a uniform information structure provides improved opportunities for research and knowledge development.

Plan for continued work and implementation

In order to develop a national model for risk assessment, one needs

- clarify the purpose of such a model
- determine best available knowledge
- decide which factors should be included in the model and determine the model's complexity
- develop a uniform structure for concepts and definitions
- investigate the connection to costs and possible adjustments in today's compensation system
- create forms for implementation
- produce a plan for evaluation and further development of the model
- draw up a plan for training in connection with the introduction of the model and is used.

At the same time, the views of treating staff need to be obtained and other actors who should be included in the work identified. A model could be introduced gradually, for example for different age groups, but with the goal that all dental care patients in Sweden should be included.

Determine the purpose

The National Board of Health and Welfare's mapping has also shown that the risk assessments, and the decision support used, fulfill several different purposes. The decision aids are used, for example, to

- communicate with the patient
- decide what treatment the patient should be offered
- determine the patient's revision interval
- prioritize between patients

The regions also use the decision aids to classify patients into fee classes in order to draw up subscription agreements with patients. If and when a national model for risk assessment is developed, these different purposes should be taken into account. The purpose, or purposes, of a national model must be clear, and becomes decisive for how a model should be designed. For example, those who develop a model should reflect on how the risk grouping in a national model can affect the risk grouping in existing subscription dental care.

Determine best available knowledge

In continued work on developing a national risk assessment model, the knowledge base for a model needs to be established. A model can take support from international guidelines, expert knowledge, proven experience, as well as possible scientific support for the impact of individual factors on oral health.

One way to produce evidence where science is lacking is via the National Board of Health and Welfare's accepted processes for determining the best available knowledge. In the first place, the process is based on assessing scientific studies, but if there is no scientific basis, the experience-based knowledge for a certain way of working can be compiled. In such work, both experiences with existing risk assessment models and individual risk factors can be examined.

The National Board of Health and Welfare also states that there are foreign guidelines for risk assessments and audit intervals and that all Nordic countries work with risk assessments and use guidelines for audit intervals. A process for developing support for risk assessment can also be based on existing foreign guidelines by assessing their methodological quality, for example with the tool AGREE273 [24, 25]. Guidelines that are judged to be of good quality can then be adapted to a Swedish context, based on scientifically evaluated working methods for adapting guidelines74 [26].

At the same time, the scientific basis for further identified risk factors also needs to be evaluated. The end result can be a combination of adapted foreign guidelines and content prepared in Sweden.

Determining factors

Based on the best available knowledge, it needs to be determined which factors should be included in a national model for risk assessment. There is currently a lack of scientific support for a balanced model, but there may be scientific support for the impact of individual factors on oral health.

The National Board of Health and Welfare's mapping has also shown that certain social factors probably need to be included in a national model for risk assessment. To enable a health care provider to document and enter clearly defined data about social factors relating to a patient and needed in and for the care of the patient, constitutional amendments could be required.

Further investigation is needed into the conditions for sharing information about patients between dental care and healthcare within the framework of a national model for risk assessment. The risk assessment could be facilitated by a national model for risk assessment that includes relevant factors and can collect data from other parts of the medical record system and other systems, if, for example, patients'

[73] Instrumentet *Appraisal of Guidelines for Research & Evaluation 2*
[74] GRADE adolopment

drug use. A first step in connection with other systems may be to give dental care the opportunity to gain access to the patient's medication information after consent.

Establish unified information structure

There are established working methods for developing a uniform information structure. These should be used to enable the risk assessment model to become nationally uniform. That the model is based on a common language, through uniform terms, concepts and definitions, facilitates evaluation of the model, and enables it to be introduced step by step. It also enables semantic interoperability, meaning that systems understand and interpret each other correctly, and improves the possibilities for exchanging information with healthcare and other actors.

Investigate the connection to costs and possible adjustments in today's compensation system

It is possible to achieve more cost-effective dental care through a clearer connection between the national guidelines' recommendations for revision intervals and the risk grouping in a national model for risk assessment. However, it is important to take into account which incentives a reimbursement system provides patients and therapists. A national risk assessment model can thus be a tool to achieve more efficient resource management in dental care, but must then be supplemented with compensation systems that do not provide conflicting incentives.

The National Board of Health and Welfare assesses that the responsible practitioner needs to be able to adjust a possible proposal from a national model for risk assessment, when the practitioner's knowledge of the patient and clinical experience provides a better risk assessment than that provided by the decision support alone. In order to minimize both the ethical stress that may arise and the risks of incorrect payments, compensation should therefore not be linked to a risk assessment result from a model. Experience from Denmark shows the risks of linking the possibility of subsidized dental care to a potentially subjective risk assessment. Treating staff risk ending up in ethical dilemmas, where, for example, knowledge of the patient's financial situation may risk influencing the risk assessment or risk grouping. In addition, linking potential compensation to a risk assessment result can create perverse incentives. In order to minimize the risk of incorrect payments, such a compensation solution should be avoided.

Create forms for implementation

In order not to create increased administration for dental professionals, a national risk assessment model should be designed so that it can become an integrated

part of record keeping. It creates the conditions for automating the input of data into the model – from the beginning or in the future. Several decision supports are today integrated into the dental record system, and all record systems offer opportunities for some form of risk assessment module. This lowers the threshold for integrating a model into the records systems. When and if a national model for risk assessment is developed, it should be examined in particular whether it has any legal significance if a record system into which the risk assessment module is integrated is classified as a medical device or not.

The National Board of Health and Welfare assesses that dental care professionals should be involved in the entire process of developing and implementing a model, both to create the best possible model and to create better conditions for introducing the model. Service design is a method used to design services, products and processes together with the users, and could be used in the work to develop a model. The authority assesses that an information and training effort will be necessary, in order to create the conditions to introduce the model in a good way. The extent of the effort depends on how a model is designed.

Evaluation, further development and management

If and when a national model for risk assessment is introduced, it is necessary that there is a plan for evaluation and further development of the model.
The purpose of the model needs to be clearly described in order to be able to evaluate its effects. In a first step, it should be evaluated how dental care has introduced and started using the model.

It is important to evaluate the model's validity, that is, that it measures what it intends to measure. In addition, the reliability of the model should be evaluated, i.e. the extent to which repeated assessments result in similar results. Managers of current risk assessment modules also highlight the importance of comparing the outcome of the risk groupings with population statistics. In this way, it can be ensured that the risk grouping of patients at group level reflects the state of the disease in the relevant population group (for example in a region). You can also monitor how often patients come for basic examinations in relation to their possible risk group, and how the revision intervals follow the recommendations of the national guidelines. It is also possible to follow up how the amount of care received relates to a risk grouping. Another possibility is to carry out a corresponding analysis on TLV done within the framework of this mission, and at the same time check dental care consumption and dental health against actual risk grouping. Such an evaluation could include breaking patients into more groups than those possibly risk-grouped, to identify whether there are differences in outcomes even within risk groups.

In one of the decision supports for risk assessment that the National Board of Health and Welfare took a closer look at in the survey, evaluations were planned two years and four years after the introduction, with the aim of checking that the system reflected the state of the disease in the population. In the evaluation of Denmark's guidelines, the outcome of the guidelines was compared with the dental health situation in the country. The evaluation there showed that a greater proportion of the population was classified as having active disease, compared to the actual pattern of disease. This led to an adjustment of the guidelines.

A national model for risk assessment needs to be able to be updated when necessary, in order for it to be effective, to be able to identify current risks in the population and to provide support for practitioners over time. For example, business representatives for dental care have noted in recent years an increased consumption of acidic drinks and an increased use of drugs in the population, which affects the risk assessment.

Central to the follow-up and development of a national model for risk assessment is how it should be managed. The decision supports for risk assessment that the regions primarily use have been regularly updated.
The updates have been based on new scientific data, views from practitioners and business-related analyses. To make it possible to continuously share experiences and make analyses, a model should be managed in close cooperation with the users. For a national model to be
correct and useful over time, it should also be connected with areas of development within dental care, for example the development of different care processes.

One way to evaluate a risk assessment model at national level is for the dental health register to be developed with new data for statistics and analyses.
The conditions for evaluating a model would be facilitated if the National Board of Health and Welfare's dental health register included the dental health and oral status of children and young people, as well as regular and complete dental care for adults.
The National Board of Health and Welfare supported the proposal to expand the dental health register with this information in the consultation response to *When the need may rule - a dental care system for more equal dental health* (SOU 2021:8). A development of the dental health register will, however, require constitutional changes.

Follow-up and continued development of the model must be ensured both organizationally and in terms of resources. When following up, it is important to take into account the difficulties in evaluating the validity of risk assessment models.
How well the model can identify individuals with low risk (specificity) is relatively easy to evaluate. Patients who are judged to be at low risk can be followed over time.
If the patient does not develop disease, the specificity is high.
It is significantly more difficult to evaluate the model's ability to identify individuals at risk of impaired oral health (sensitivity). The difficulty in evaluating the sensitivity is due to the fact that the dental care must offer measures to reduce the risk, if they judge that a patient has an increased risk. In these cases

measures are implemented and are effective, the patient will not develop oral health problems. This is of course positive, but it results in a low sensitivity for the risk assessment model. In cases where the measures implemented are ineffective and the patient develops disease, the sensitivity of the method is, on the other hand, high. In order to safely assess the method's sensitivity, individuals who do not receive treatment must therefore be followed forward in time, which is ethically problematic. Reliability, on the other hand, is relatively uncomplicated to evaluate.

Educational efforts will be necessary

Risk assessments are already included in the professional practice of dentists and dental hygienists, and as part of Swedish university education. The teaching on risk assessment therefore needs to be harmonized with the national model for risk assessment.

The National Board of Health and Welfare also assesses that even already active dental care staff need an information and training effort if a national model for risk assessment in dental care is introduced. The scope of the effort depends on how a model is designed, because dental care already today carries out risk assessments on a large scale.

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Appendix 1. SBU prepares

Risk assessment model in dentistry - a knowledge base

Background

The risk assessment forms an important decision-making basis partly for the individual patient's treatment plan, partly for how often the patient should undergo regular examination (revision interval). In a risk assessment, risks for the development or worsening of oral cavity diseases are included. What is taken into account during an examination and risk assessment are caries, gingivitis, periodontitis, other infections in the tooth or surrounding bone, changes in the oral mucosa, as well as chewing function, bite physiology, bite development, previous dental treatments, salivary function, dietary habits, oral hygiene, oral care habits as well as general health and general diseases including medication. In addition to a risk assessment, the patient's own wishes regarding aesthetics and function etc. are also taken into account. On behalf of the National Board of Health and Welfare, SBU has investigated whether there are studies, primary studies or systematic overviews, which have studied/evaluated risk assessment models in dental care. The models must provide an overall assessment of all the risks that must be taken into account for the patient and the models must be used by dental care.

Method

A narrow and focused literature search was conducted in the database Medline date 20230223 (Appendix 1). The search results identified both systematic reviews (SREs) and primary studies.

The literature that was captured was reviewed by a project manager at SBU.

Results

The literature search that focused on systematic reviews (SÖ) resulted in 671 hits and the literature search that focused on primary studies resulted in 5,801 hits. These were reviewed by a project manager who, after a review of the title and abstracts, assessed that 4 SÖ and 37 primary studies could be relevant. In a full-text review of these, it was judged that none of the studies were relevant. Reasons why they were judged to be irrelevant were, for example, that they did not study a model that was intended to be used by dental care or that they only assessed one or a couple of risk areas, e.g. caries or periodontitis and not a total assessment that forms the basis of a treatment or revision plan. The studies that were excluded during the full-text review are reported in Table 1.

Table 1 Excluded studies and reasons for exclusion.

Study (reference)	Reason for exclusion
Chalmers 2005 [1]	Does not evaluate risk assessment model
Clarkson 2009 [2]	Does not evaluate risk assessment model
Clarkson 2021 [3]	Does not evaluate risk assessment model
Clarkson 2020 [4]	Does not evaluate risk assessment model
Clarkson 2018 [5]	Does not evaluate risk assessment model
Cook 2000 [6]	Does not evaluate risk assessment model
D´Avila 2021 [7]	Does not evaluate risk assessment model
Douglass 1998 [8]	Does not evaluate risk assessment model
Feng 2022 [9]	Does not evaluate risk assessment model
Finotto 2020 [10]	Does not evaluate risk assessment model
Geisinger 2022 [11]	Does not evaluate risk assessment model
Building 2003 [12]	Does not evaluate risk assessment model
Harris 2020 [13]	Does not evaluate risk assessment model
In 2022 [14]	Does not evaluate risk assessment model
Janzen 2003 [15]	Does not evaluate risk assessment model
Kirkup 2016 [16]	Does not evaluate risk assessment model
Klotz 2020 [17]	Does not evaluate risk assessment model
Coach 2007 [18]	Does not evaluate risk assessment model
Luxuries 2006 [19]	Does not evaluate risk assessment model
Luxuries 2014 [20]	Does not evaluate risk assessment model
Morales 2023 [21]	Does not evaluate risk assessment model
Nikiforuk 1997 [22]	Does not evaluate risk assessment model
Page 2010 [23]	Does not evaluate risk assessment model
Page 2004 [24]	Does not evaluate risk assessment model
Page 2005 [25]	Does not evaluate risk assessment model
Petersson 2017 [26]	Does not evaluate risk assessment model
Richards 2018 [27]	Does not evaluate risk assessment model
Richardson 2005 [28]	Does not evaluate risk assessment model

Study (reference)	Reason for exclusion
Riley 2013 [29]	*Does not evaluate risk assessment model*
Roberts 2000 [30]	*Does not evaluate risk assessment model*
Roberts 2000 [31]	*Does not evaluate risk assessment model*
Roberts 2000 [32]	*Does not evaluate risk assessment model*
Rollings 2021 [33]	*Does not evaluate risk assessment model*
Ronderos 2004 [34]	*Does not evaluate risk assessment model*
Slashcheva 2021 [35]	*Does not evaluate risk assessment model*
Tribe 1991 [36]	*Does not evaluate risk assessment model*
Stands 2021 [37]	*Does not evaluate risk assessment model*
Stout 2009 [38]	*Does not evaluate risk assessment model*
Twetman 2009 [39]	*Does not evaluate risk assessment model*
Twetman 2013 [40]	*Does not evaluate risk assessment model*
Wang 2020 [41]	*Does not evaluate risk assessment model*

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Search documentation

Medline via OvidSP 23 February 2023

Title: Dental care – risk assessment (narrow and focused search)

	Search terms	***Items found***
	Population: Stomatognathic diseases	
1.	exp *Stomatognathic Diseases/	**469447**
2.	exp *Dentistry/	**311496**
	(dental* or dentist* or "oral health*").ti.	**186637**
	((dental or dentist* or oral) adj (care or health or prevent*)).ab,ti.	**51753**
	1 OR 2 OR 3 OR 4	
	Intervention: Risk assessment	
	(risk adj1 (assess* or based or categor* or indicat* or level* or model* or predict* or profil* or prognos* or protocol* or scor* or stratif* or system* or variab*)).ab,ti. OR (predict* adj1 (model* or perform* or tool*)).ab,ti. OR (assess* adj1 (protocol* or system* or tool*)).ab,ti. OR (patient adj (profil or categor*)).ab,ti.OR (prognos* adj1 (model* or perform* or tool*)).ab,ti. OR (riskbased or riskinterval* or "score card*" or scorecard*).ab,ti.OR "early indicator* ".ab,ti. OR (recall adj (interval* or strateg*)).ab,ti.	**422647**
	Study types: systematic reviews and meta-analyses	
	Systematic Review.pt. OR Meta-Analysis.pt. OR Cochrane Database Syst Rev.ja. OR ((systematic adj4 review) OR "meta analys*" OR metaanalys*).ti,ab,bt.	**443591**
	Combined sets	
	4 AND 6 AND 7	***818***
	(1 OR 3 OR 4) AND 6	***6855***
	Final result	
	limit to (danish or english or norwegian or swedish)	**671**
	limit to (danish or english or norwegian or swedish)	**5801**

The final search result, usually found at the end of the documentation, forms the list of abstracts.

.ab. = Abstract; .ab,ti. = Abstract or title; .af. = All fields; .bt. = Book title; **exp** = Term from the Medline controlled vocabulary, including terms found below this term in the MeSH hierarchy; .fs. = Floating sub-heading, does not include terms found below this term in the MeSH hierarchy; .kf. = Author keyword; .sh. = Term from the Medline controlled vocabulary; .ti. = Title; .xs. = Floating sub-heading, includes terms found below this term in the MeSH hierarchy; / = Term from the Medline controlled vocabulary, but does not include terms found below this term in the MeSH hierarchy; the end of a free text term); .mp. = Text, heading word, subject area node, title; Marks; searches for an exact phrase; **adjn** = * = Focus (if found in front of a MeSH-term); * **or $** = Truncation (if found at Positional operator that lets you retrieve records that contain your terms (in any order) within a -- = Citation specified number (n) of words of each other; ? = replaces one or no letters; **#** = replaces one letter

Appendix 2. The National Board of Health and Welfare's literature search

Description of identified guidelines

In the literature search, 39 studies or guidelines on risk assessments in dentistry were identified. Of these, seven guidelines are deemed to contain recommendations or advice with support on risk assessment. These guidelines have been developed in England [1], Scotland [2, 3] Denmark [4], Norway [5, 6] and Finland [7].

The English guideline from *the National Institute for Health and Care Excellence* (NICE) was published in 2004 [1]. The guideline is kept up to date and the most recent search for new evidence was carried out in 2020. The guideline contains recommendations on individual-based revision intervals for both children and adults. The guideline's conclusions are that the scientific basis for risk assessment is deficient, but gives recommendations that intervals between examinations should be adapted based on each individual's level of illness and risk of oral ill health. The guideline also contains information on factors that affect the risk of developing oral disease. These factors are included in a checklist that dental professionals can use to support the dental professional's clinical experience and judgment in deciding on the appropriate revision interval.

The Scottish guidelines deal with the prevention and treatment of caries in children and adolescents [2, 3] The guidelines are published by the *Scottish Intercollegiate Guidelines Network* (SIGN) [2] and *the Scottish Dental Clinical Effectiveness Program* (SDCEP) [3], both of which are part by NHS Scotland.
Parts of the guideline from SDCEP are based on evidence presented in the guideline from SIGN. The guidelines contain recommendations on caries risk assessment and appropriate intervals for examination. A number of factors that influence the risk of caries development are reported in the guidelines.
The recommendations on revision intervals are based on the English guidelines from NICE [1].

In the Danish guidelines from *the National Board of Health ,* guidance is given to dental care regarding the determination of intervals between examinations [4].
The guidelines were published in 2013 and updated in 2016. In the Danish guidelines, a quality assessment is made of the English and Scottish guidelines mentioned above, where the English guideline is deemed to have been produced with the best quality. The Danish guidelines are therefore based on the guidelines from NICE, with some adaptation to suit a Danish context. The guideline recommends individualized intervals between examinations and that these should be based on the current level of oral disease and risk of oral

ill health in combination with the dental staff's clinical judgment and experience.

In Norway, two guidelines for dental care concerning children and adolescents (0–20 years) [5] and adults [6] were published by *the Directorate of Health* during 2018–2019. In the guidelines for adult patients, a recommendation is made that the dentist should determine the time for the next examination based on the patient's risk of developing caries, periodontitis or other oral diseases, with reference to the English and Danish guidelines. The guidelines for children and young people are extensive and contain, in addition to recommendations on caries risk assessment and information on at what age patients should be examined, also support for dental care in the form of how a status examination should be carried out and checklists with factors that affect the risk of oral ill health. These checklists are prepared based on the English and Danish guidelines with some adaptation.

The guidelines from the Finnish medical association *Duodecim* refer to the prevention, diagnosis and treatment of periodontitis [7]. The guidelines are not available for download and have therefore not been reviewed at the full-text level, but according to the abstract contain information on periodontitis risk assessment.
The guidelines were updated in 2017.

After dialogue with the Nordic countries' Chief Dental Officers, the National Board of Health and Welfare is also aware of ongoing work in Finland with recommendations on examination intervals that will be published in the spring of 2024.

In this report, only identified international guidelines are presented. They have not been quality checked.

Table 1. List of identified guidelines

Author, year, reference, country	title	Patient-group	Recommendations about...	Other information
• NICE, 2004*, England, [1] • *updated it's senast 2020	Dental Recall: Recall Interval Between Routine Dental Examinations	Children and adults	Examination interval (children 3–12 months; adults 3–24 months) Risk assessment, checklist of factors influencing risk of oral ill health	
SIGN, 2014, Scotland, [2]	Dental Interventions to Prevent Caries in Children (A national clinical guideline, SIGN CPG 138)	Barn	Risk assessment with factors that affect the risk of caries	
SDCEP, 2018, Scotland, [3]	Prevention and Management of Dental Caries in Children (Dental Clinical Guidance, 2nd edition)	Barn	Examination interval (based on NICE) Risk assessment with influencing factors risk of caries	Based to certain part on the guidelines from NICE and SIGN
Board of Health its, 2016, Denmark, [4]	NKR: Determination of Intervals Between Diagnostic Investigations in The dental care (second edition)	Children and adults	Survey interval (12–24 months) Risk assessment, checklist of factors influencing risk of oral ill health	Based on the guidelines from NICE, incl adaptation for Danish context
Directorate of Health and, 2018*, Norway, [5] *last updated in 2022	Dental health services for children and young people aged 0–20 National professional guideline.	Barn (0-20 years)	Survey interval (12–24 months) Fixed ages then children should be examined Risk assessment with factors that affect the risk of oral illness	Based to some extent on the guidelines from NICE and Board of Health the rail
Directorate of Health et, 2019, Norway, [6]	Dental health – Health-promoting and preventive measures for adults over the age of 20. National professional councils.	Adults (>20 years)	Survey interval (12–24 months)	Based to some extent on the guidelines from NICE and Board of Health the rail
twelve 2010*, Finland, [7]	Update on Current Care Guidelines: Prevention, Early	Adults	Risk assessment of periodontitis	Not available in full text

Author, year, reference, country	title	Patient-group	Recommendations about...	Other information
*last updated in 2017	Diagnosis and Treatment of Chronic Periodontitis (English title)			

Question statement

Guidelines on risk assessment or audit intervals were sought in order to answer the following question:

What is the impact of prediction models for assessing risk (risk assessment) for oral ill health?

Population: People visiting dentistry for examination (adults and children, regardless of medical history)

Intervention: Prediction models (regardless of model*) to assess prognosis/risk for oral ill health

Study types: scientific articles or guidelines

Search documentation

A search for international guidelines was conducted in December 2023.
Guidelines were searched partly via the database PubMed, but also through an independent search in several databases (see detailed information in the literature search documentation).

Table 2. Number of reviewed and included articles/ guidelines

Reviewed and included articles/ guidelines	Quantity
Articles/ guidelines read at title/ abstract level	34
Guidelines that are deemed to answer the question	7

Table 3. Topic: What effect do prediction models have for assessing risk of oral disease? Guidelines

Database: PubMed Database provider: NLM Date: 2023-12-12, 2023-12-19

Search no. Term type *)	Search terms	Database/ Antal ref. **)
1. Mesh/ FT	"Mouth Diseases/ prevention and control"[Majr:NoExp] OR "Periodontal Diseases/ prevention and control"[Majr:NoExp] OR "Tooth Diseases/ prevention and control"[Mesh] OR Oral Health[Mesh] OR	138,773

Search no.	Term type *)	Search terms	Database/ Antal ref. **)
		"Preventive Dentistry"[Mesh] OR "Dental Prophylaxis"[Mesh] OR caries prevention[tiab] OR oral disease prevention[tiab] OR oral health[tiab] OR periodontal disease*[tiab] OR periodontitis[tiab] OR tooth disease*[tiab]	
2.	FT	dental examination[tiab] OR dental check-Up*[tiab] OR visual examination[tiab] OR image-based examination[tiab] OR dental check*[tiab]	**4,722**
3.		1 AND 2	**1,492**
4.	Mesh/ FT	"Risk Assessment"[Majr] OR "Risk Factors"[Mesh] OR risk-based[tiab] OR early indicators of disease[tiab] OR risk assessment[tiab] OR risk group*[tiab] OR risk of caries[tiab] OR risk[ti] OR cariogram[tiab] OR detection[tiab] OR International Caries Detection and Assessment System[tiab] OR ICDAS OR R2[tiab] OR checklist*[tiab] OR dental recall interval*[tiab] OR oral health review*[tiab] OR “intervals reviews”[tiab:~3] OR “intervals check-up”[tiab:~2]	**2,631,743**
5.		3 AND 4	**306**
6.		5 AND Filters: Guidelines	**0**
7.	Cadth Breda filter for guidelines	Clinical pathway[mh] OR Clinical protocol[mh] OR Consensus[mh] OR Consensus development conferences as topic[mh] OR Critical pathways[mh] OR Guidelines as topic[mh] OR Practice guidelines as topic[mh] OR Health planning guidelines[mh] OR guideline[pt] OR practice guideline[pt] OR consensus development conference[pt] OR consensus development conference, NIH[pt] OR position statement*[tiab] OR policy statement*[tiab] OR practice parameter*[tiab] OR best practice*[tiab] OR standards[ti] OR guideline[ti] OR guidelines[ti] OR ((practice[tiab] OR treatment*[tiab]) AND guideline*[tiab]) OR CPG[tiab] OR CPGs[dress] OR consensus*[dress] OR ((critical[dress] OR clinical[dress] OR practice[dress]) AND (path[dress] OR paths[dress] OR pathway[dress] OR pathways[dress] OR protocol*[tiab])) OR recommendat*[ti] OR (care[tiab] AND (standard[tiab] OR path[tiab] OR paths[tiab] OR pathway[tiab] OR pathways[tiab] OR map[tiab] OR maps[order] OR plan[order] OR plans[order])) OR (algorithm*[order] AND (screening[order] OR examination[order] OR test[tiab] OR tested[tiab] OR testing[tiab] OR assessment*[tiab] OR diagnosis[tiab] OR diagnoses[tiab] OR diagnosed[tiab] OR diagnosing[tiab])) OR (algorithm*[tiab] AND (pharmacotherap*[tiab] OR chemotherap*[tiab] OR	

Search no.	Term type *)	Search terms	Database/ Antal ref. **)
		chemotreatment*[dress] OR therap*[dress] OR treatment*[dress] OR intervention*[dress]))	
8.		5 AND 7 Filters: Publication date from 2000- Filters: Humans	21
9.		5 AND (Guideline[pt] OR guideline*[ti])	3

PubMed:

*) MeSH = Medical subject headings (established subject words in Medline/ PubMed)
Exp = The term is searched including the more specific terms that are subordinate
NoExp = Only that term is searched, the more specific, subordinate terms are excluded
MAJR = MeSH Major Topic (the term describes the main content of the article)
SB = PubMed's filter for:

- systematic overviews (systematic[sb])
- all MeSH indexed articles (medline[sb])

FT = Freetext term/ s
tiab= search in the title and abstract fields
ot = Other term: subject word (keyword) that usually does not exist as a MeSH term
**) The references marked in bold are saved

Table 4. Topic: What effect do prediction models have for assessing risk of oral ill health? Guidelines

Database: National authorities and organizations (see below) Date: 2023-12-18- 2023-12-19

Search no.	Term type *)	Search terms	Database/ Antal ref. **)
		Norway: (The knowledge center for the health service (part of Institute of Public Health), Directorate of Health)	
1.		Directorate of Health : Directorate of Health (2019). Dental health – Health-promoting and preventive measures for adults over 20 years of age (2019) [online document]. Oslo: Norwegian Directorate of Health (last professionally updated 02 May 2019, read 13 December 2023). Available from https:// www.helsedirektoratet.no/ faglige-rad/ helsefremmende-og-forebyggende-tannhelsetiltak-for-voksne-over-20-ar Norwegian Directorate of Health (2018). National professional guideline for dental health services for children and young people aged 0–20 [online document]. Oslo: Norwegian Directorate of Health (last professionally updated 31 March 2022, read 13 December 2023). Available from https:// www.helsedirektoratet.no/ retningslinjer/ tannhel viewing services-for-children-and-youth-020-years-old	2

Search no.	Term type *)	Search terms	Database/ Antal ref. **)
		Denmark *(Ministry of the Interior and Health, National Agency for Health)*	
2.		*The National Board of Health:* *Subject: Dental health, Recommendations, Keyword: Intervals* *-NKR: Determination of intervals between diagnostic examinations in dentistry (2016)* *-Evaluation of the National Clinical Guideline for determining intervals between diagnostic examinations in dentistry (2017)*	2
3.		***GIN Guidelines International Network*** *Dental intervals, Oral health, Dental recall, recall intervals* *English, danish* *Publication Scope: prevention*	2
4.		***SIGN Scottish Intercollegiate Guidelines Network*** *Topic: Mouth and Dental*	0
5.		***SDCEP Scottish Dental Clinical Effectiveness Programme***	1
6.		***FDI World Dental Federation*** *https:// www.fdiworlddental.org/ policy-statements*	0
		Google:	
7.		*"recall interval" OR "dental recall" AND guidelines.* *NHS England, NIH National Library of Medicine*	2
		Canada:	
8.		*CADTH – Canada´s Drug and Health Technology Agency: Dental and Oral Health, guidance OR guidelines*	**3 (0)**
9.		*JCDA – Canadian Dental Association* *Guidelines, dental recall OR dental intervals OR recall intervals OR check-up* OR dental risk assessment*	0
10.		***NICE (UK)***	
11.		*Dental recall intervals, Guidance*	2

*) The references marked in bold are saved

References

1. NICE. Dental checks: intervals between oral health reviews (CG19). NICE; 2004. Retrieved 2023-12-19 from: https://www.nice.org.uk/guidance/cg19.
2. SIGN. Dental interventions to prevent caries in children (SIGN CPG 138). 2014. Retrieved 2023-12-19 from: https://www.scottishdental.org/wp-content/uploads/2014/04/SIGN138.pdf .
3. Scottish Dental Clinical Effectiveness Programme. Prevention and Management of Dental Caries in Children. 2018.
4. The National Board of Health. NKR: Determination of intervals between diagnostic examinations in dentistry. 2016. Copenhagen: National Board of Health; 2016.
5. The Directorate of Health. Dental health services for children and young people aged 0–20. National professional guideline. 2018 (updated 2022). Oslo: Directorate of Health; 2022.
6. The Directorate of Health. Dental health – Health-promoting and preventive measures for adults over the age of 20 (2019). National professional councils. 2019. Oslo: Directorate of Health; 2019.
7. Duodecim. Update on current care guidelines: prevention, early diagnosis and treatment of chronic periodontitis. 2010; 126(20):2414-5.

Appendix 3. Factors that emerged in dialogue with the expert group

Table 1. Risk of Orofacial disease states that may pose a risk to the patient's general health.

Medical conditions that can increase the risk of oral diseases and/ or increase the risk of complications during dental treatment.

Negative factors/ risk factors	***Positive factors/ health factors***
Irregular dental contact	*Regular dental contact*
Bleeding risk	*Good self-care/ support for oral care*
Dry mouth	*Toothache support with a low co-payment*
Risk of infection	
Lack of self-care	
Mucosal lesions	
Low autonomy - need for support and help	
Medicines (e.g. bisphonates, blood thinners, saliva inhibitors, etc.)	
General disease that affects oral health directly or via the treatment given	
Dental support with a high co-payment	
Cognition (weak)	
Poor motor skills (manual, oral)	

Source: Associated expert group

Table 2. Risk of marginal periodontitis.

Negative factors/ risk factors	***Positive factors/ health factors***
Deficient plaque control	*Good plaque control*
Clinical attachment loss in the past 5 years	*Regular dental care (periodontitis examination condition of gums and tooth attachment (bone loss)*
% bone loss/ age > 0.25	*No clinical attachment loss in the last 5 years*
Smoker	*% bone loss/ age < 0.25*
Irregular dental care. Lack or lack of periodontitis examination condition of gums and tooth attachment (bone loss)	*non-smoker*
Diabetes	
Cardiovascular disease	

Source: Associated expert group

Table 3. Risk of caries disease.

Negative factors/ risk factors	***Positive factors/ health factors***
Acid-forming and acid-resistant microflora	*Fluoride (regular use)*
Less good dietary habits (high and/ or frequent sugar consumption)	*God plackkontrol*
Poor plaque control	*Regular dental care*
Irregular dental care	*Good dietary habits - low sugar consumption*
High caries experience	*Low caries experience*
Disease activity (caries active)	*Disease activity (no caries activity)*
No or irregular fluoride use	

Source: Associated expert group

Table 4. Risk of orofacial pain.

Negative factors/ risk factors	***Positive factors/ health factors***
Pain duration	
Pain from temple, jaw or jaw joint once/ week or more often	
Pain when gaping or chewing once/ week or more often	
Locking or hooking in the jaw once/ week or more often	
Comorbidity of painful/ not painful general conditions/ diseases (general hypermobility, headache, chronic pain with other location, rheumatic diseases, neuropathic diseases, etc.)	
Parafunctions	
Nonspecific physical symptoms throughout the body	
Perceived stress	
Depression, anxiety	
Low sleep quality	

Source: Associated expert group

Table 5. Risk of dental caries, trauma, bite deviation, fear of dentistry in pedodontics (child and adolescent dentistry)75 .

Negative factors/ risk factors	***Positive factors/ health factors***
Protruding maxillary incisors (traumarisk)	*Fluoride (regular use)*
Acid-forming and acid-resistant microflora	*God plackkontrol*
Less good dietary habits (high and/ or frequent sugar consumption)	*Regular dental care*
Dry mouth	*Good dietary habits - low sugar consumption*
Poor plaque control	*Low caries experience*
Irregular dental care	*Disease activity (no caries activity)*
High caries experience	*Low intake of acidic foods*
Disease activity (caries active)	
High intake of acidic foods	
Negative experience with previous dental care	
Mineralization anomalies	
Aberrant eruption patterns (direction teeth grow)	
Overcount/ undercount of number of teeth	

Source: Associated expert group

[75] There are also risk factors that have to do with being a child, for example physical and mental development and incompletely developed balance that can contribute to an increased risk of dental trauma. Games and sports activities that are more common at that age also contribute to the risk of trauma.

Appendix 4. Health economic reasoning

This appendix is written by health economists Thomas Davidson and Victor Abdalla at Linköping University.

According to the government mandate, cost estimates for implementing any proposed interventions must be reported. Within the framework of the assignment, assessing the conditions for the introduction of a national model for risk assessment is included. As the National Board of Health and Welfare's report does not include any concrete proposals for the design of a model, no cost calculations are provided in the report of the assignment.

The government mandate states that any proposals must be expedient and cost-effective, fit within existing financial frameworks and not entail increased costs within the framework of the general dental care grant or for the state dental care support in general. It also states that any proposals must be designed so that the risks of incorrect payments are minimised. In this chapter, reasoning is carried out about the possible consequences of introducing a national model for risk assessment with current state dental care subsidies.

The state accounted for approximately SEK 6.8 billion of the total cost of dental care (31.5 billion) in 202176. The three parts of the state dental care support included approximately SEK 2.1 billion for ATB, approximately SEK 67 million for STB and approximately 4.7 billion for the high cost protection.

The support applies to everyone over the age of 23, as younger individuals have access to free dental care, which is indirectly financed by the state. The reasoning within this assignment is therefore primarily about redistribution from the state's budget for free dental care, how the dental care support could be developed for adults and redistribution of resources between the various supports.

The dental support is designed so that everyone over the age of 23 can use an ATB of 300 or 600 kroner per year, and the support can be saved for two years. The purpose of the grant could be to encourage individuals to undergo an examination within 24 months, and that the grant should replace the largest part of this77. STB helps patients who, as a result of illness or disability, need regular preventive dental care.

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[76] Dental and Pharmaceutical Benefits Agency. Follow-up of the dental care market between 2019 and 2022 - refers to dental care within the state dental care support. Stockholm: Dental and pharmaceutical benefits agency; 2023.

[77] The purpose of ATB was to encourage regular dental contact. They also saw a point with higher compensation for young people so that the high frequency of visits from children's dental care is maintained. This leads to healthy patients being encouraged to visit dental care, which runs counter to the new NR for dental care, which wants resources to focus on those who need dental care, healthy patients to come less often.

The contribution is SEK 600 per six months. The high-cost protection works so that it covers 50 percent of all costs over SEK 3,000 during a year and 85 percent of all costs over SEK 15,000 during a year. However, only costs up to the reference price are reimbursed and not the costs that possibly exceed the reference price78. However, not all measures are reimbursed in dental care, for example purely cosmetic measures can be judged to fall outside the high-cost cover.

Because ATB is a contribution made prospectively, and a risk assessment is a prospective statement of a patient's risk of developing or worsening oral diseases, injuries and conditions in the future, the focus of this chapter is on reasoning about changes to ATB .
The reasoning about changes to ATB includes reasoning about possible redistributions within other state aid.

Prioritization principles

In healthcare, three basic ethical principles are used as a starting point when prioritizing public resources. These principles are part of the so-called ethical platform, which was developed through the government
the investigation *Vården's difficult choices* (SOU, 1995:5). The principles were incorporated into the Health and Medical Care Act in 1997 and since then govern how health and medical care resources within publicly funded care are to be distributed.

Below is a brief description of each principle.

The human value principle *emphasizes that every individual has inherent value and the right to respect and dignity regardless of health status, age, gender or other factors. The equal value and integrity of patients must be preserved and respected. Prioritization must therefore not be done based on patients' gender, chronological age, ability to work, etc.*

The need-solidarity principle *emphasizes the importance of meeting the health care need. The principle stipulates that healthcare resources must be invested in the patients who have the greatest need. According to the principle, the needs of weak groups and groups that find it difficult to make their voices heard must be given special consideration.*

The cost-effectiveness principle *means that the resources in health care should be used in an efficient way to maximize*

[78] Dental and Pharmaceutical Benefits Agency. Follow-up of the dental care market between 2019 and 2022 - refers to dental care within the state dental care support. Stockholm: Dental and pharmaceutical benefits agency; 2023.

> *the result and the benefit for the patients and to economize on the limited resources of health and medical care.*

In the investigation, it appears that the principles are lexically arranged so that the human value principle is most important, then the needs-solidarity principle and lastly the cost-effectiveness principle. In daily practice, this is applied so that treatments for conditions that are judged to be serious may cost more per effect gained than treatments for conditions that are less serious.

However, dental care is not covered by this platform. Dental care was discussed in the investigation but was deliberately left out. Nor are the principles enshrined in the Dental Care Act, and there is thus no requirement for dental care to follow these principles. But with several actors there is a goal to apply the ethical platform also in dental care. For example, the National Board of Health and Welfare starts from the ethical platform when national guidelines in dental care are drawn up, and many regions strive to prioritize their resources in accordance with these principles. Furthermore, the state inquiry proposed *When the need must rule – a dental care system for more equal dental health* (SOU 2021:8) that the ethical principles should also be introduced in dentistry.

Priorities and ATB

ATB is not need-based but is instead given equally to everyone, based on age. Since the grant is the same for everyone regardless of need, the compensation model clashes with the need-solidarity principle which states that priorities should be given to those with the greatest need. Furthermore, it conflicts with the principle of human dignity as certain age groups are favored through higher contributions. The compensation system risks leading to some individuals visiting the dental care for a basic examination earlier than they need, so that the allowance is not lost.

Calculations for hypothetical scenarios

As previously mentioned, no concrete proposals are provided in the report of the assignment and therefore no associated cost calculations are provided either. However, it is possible to set up some alternative scenarios as a basis for hypothetical cost calculations. Four such scenarios are presented below. For comparison, the current situation is also reported.

0. Today's situation

1. Improved risk adjustment in accordance with the National Board of Health and Welfare's guidelines

2. Thinning out of ATB

3. Winding up of ATB

4. Termination of free dental care between the ages of 19 and 23

These scenarios and associated health economic aspects are reported and discussed in the coming parts.

0 – Today's situation

Today's situation has been briefly described above. In addition to the state dental care support, individuals in the age group 19–23 who currently use free dental care can also be considered. The funding for this age group is paid for indirectly by the state through an extended state grant to the regions of SEK 576 million.

Today's situation thus means a cost to the state of just over SEK 6.8 billion, of which the largest item is the high-cost protection. The cost will be approximately 7.4 billion if you include the state's costs for the age group 19–23 years.

Scenario 1 – Improved risk adjustment

Improved risk adjustment, that patients visit dental care for basic examination in accordance with the national guidelines, would lead to a more efficient use of resources in dental care. In the long term, it should also result in lower costs, with possibly increased short-term costs. For example, more individuals at high risk could be identified and receive preventive measures, and at the same time more individuals at low risk could be identified, for whom unnecessary measures could be avoided.

The National Board of Health and Welfare has drawn up national guidelines for audit intervals between basic surveys. The guidelines recommend that low-risk individuals should be examined every 24–36 months, and high-risk individuals every 12–18 months (Socialstyrelsen, 2022)79 .

The SKaPa quality register collects statistics on risk assessments and audit intervals. Today, all public dental care organizations and 826 private practices are connected. Statistics from 202280 indicate that there is little difference between assessed risk group81 and audit interval, see table 1. For the recommended audit intervals to be followed should

[79] The National Board of Health and Welfare. National guidelines for dental care – Support for governance and management 2022. Stockholm: The National Board of Health and Welfare; 2022.

[80] Swedish quality register for caries and periodontitis. Annual report 2022. Karlstad: Swedish quality register for caries and periodontitis; 2023.

[81] The risk grouping is based on data from the decision supports that classify patients in risk groups and report the data to SkaPa.

individuals in the current sample classified as high risk have shorter audit intervals82 .

Table 1. Average number of months between baseline examination.

Sorted by age and risk group, year 2022.

Age group	Low risk group	Moderate risk group	High risk group
24–49 years	27,4	23,7	21,8
50–79 years	26,3	23,0	21,4
80 years and older	25,3	22,7	21,2

Source: SkaPa 2023

Today's methods for predicting caries and periodontitis have weak predictive ability in individuals who have not previously had the disease (Havsed et al, 2023)83 , but the methods are better at classifying risk in individuals who have previously been ill (Mejáre et al, 2014)84 . This makes it difficult to find appropriate audit intervals for surveys. Furthermore, it creates challenges for using a prospective replacement model that relies on the reliability of the prediction models. To minimize the risk of incorrect payments, the compensation model could instead be retrospective. For example, funds that are currently used for ATB and STB can be redistributed to the high-cost protection, where costs are paid retroactively based on the need that has arisen. Alternatively, or simultaneously, resources can be increased for work on disease prevention measures. This would likely lead to fewer people needing the high-cost cover in the long term, which in turn would likely lead to lower overall dental costs.

Scenario 2 – Sparseness of ATB

Below are examples of how ATB could be thinned out to harmonize with national guidelines' recommendation that low-risk individuals should visit the dental office for a baseline examination up to every three years.

- If ATB is instead offered every three years, but still with the same amounts previously paid out over a two-year period (2x300 kroner or 2x600 kroner), this would remove any incentive to go to the dentist for a new basic examination earlier than the guidelines recommend for low-risk patients, and at the same time save up to 700 million kroner per year, all otherwise equal. However, this would have a negative

[82] The revision interval is influenced by both the therapist's assessment, the patient's wishes and ultimately og sidst once the patient arrives at the dentist.

[83] Havsed, K., Hänsel Petersson, G., Isberg PE., Pigg M., Svensäter, G., the Foresight Research Consortium & Rohlin, M (2023). Multivariable prediction models of caries increment: a systematic review and critical appraisal. Systematic Reviews, 12(202).

[84] Mejàre, I., Axelsson, S., Dahlén, G., Espelid, I., Norlund, A., Tranæus, S., & Twetman, S. (2014). Caries risk assessment. A systematic review. Acta Odontologica Scandinavica, 72, 81–91.

impact on the incentives for high-risk patients to visit dental care more often. The saving of SEK 700 million is expected to be slightly lower as the measure would provide increased incentives to use their entitled ATB.
The savings on ATB could have been redistributed to the high-cost protection or subsidy of disease and cause prevention measures. An addition of SEK 700 million would be an addition of approximately 15 percent of the resources in the high-cost protection.

- If ATB were to be paid out once every three years as described above, but adjusting the subsidy to exactly cover the reference price for a basic examination carried out by a dental hygienist would result in a cost saving per payment of 19 percent (730 kroner instead of 900 kroner over a three-year period) for the age group 30–64, and 59 percent for the ages 24– 29 and those over 64 (730 kroner instead of 1800 kroner over a three-year period). As above, however, the total saving is expected to be lower, as more people are expected to use their contribution. The surplus from the savings could have been redistributed to the high-cost protection or subsidy of disease and cause prevention measures.

- If ATB should be spread out depending on each individual's assessed risk of disease, condition or injury in the mouth, better effectiveness of the grant would be achieved, but due to the uncertainty of today's prediction methods, it can be challenging, especially considering that the number of incorrect payments is desired to be minimized.

Scenario 3 – Decommissioning of ATB

If ATB were to be dismantled, this would free up approximately SEK 2.1 billion of the state's resources annually. If this in turn would reduce disease prevention work, it could in the long run lead to increased costs for treatment, but probably not to the same extent as the savings. If the saving on ATB is instead applied to the high-cost protection and subsidy of disease and cause prevention efforts, the resources would probably be redistributed to individuals with relatively worse dental health and relatively higher expenses. If the saving of 2.1 billion were added to the high-cost protection, this would generate an addition of 45 percent.

In 2022, 1.2 million individuals used the high-cost protection85. If you factor out the savings from discontinuing ATB (2.1 billion kroner) for these individuals, it becomes kroner 1,776 per recipient, per year. Thus, the floor for when the high-cost protection comes in could have been lowered. This, in turn, could provide incentives to overtreat low-risk individuals. Below are examples of how the money could have been distributed instead.

[85] Försäkringskassan's statistics database. Insurance Fund; 2024. Retrieved from: https://www.forsakringskassan.se/statistik-och-analys/statistikdatabas#!/tand/tand-allmant.

- Subsidy of the most costly measures that are currently offered within dentistry[86] where measures have been sorted based on the highest cost. They cost between SEK 5,640 and SEK 38,130 when they are carried out in general dental care in 2022 according to the reference price list. In the same year, the costs of these measures amounted to approximately SEK 2.2 billion. These measures could thus have been subsidized either completely or to a greater extent, to cover the odontological need for the most costly measures. The money had also been enough to subsidize the most costly measures in the next segment, the codes between 806 and 863, with an additional 50 percent compared to today. Alternatively, the measures linked to disease prevention and cause-oriented treatment could have been subsidized to a greater extent. It could reduce dental care costs in the long term.

  Another option could have been that individuals with the highest total expenses during a certain period of time could be entitled to an increased subsidy.
- The next example is based on the above reasoning, but in addition to costs, the financial ability of individuals is also taken into account. Because even though the above example would satisfy the dental needs of individuals with the highest costs, it may still exclude individuals with low financial ability. It could constitute an obstacle for individuals to receive preventive measures, something that could be very costly in the long run.

  According to this example, Försäkringskassan could have tested the individual's financial conditions in relation to their expenses for dental care. However, this would in turn lead to additional work for the Swedish Social Insurance Agency.

Scenario 4 – Discontinuation of free dental care between the ages of 19 and 23

For several years, dental care has been provided free of charge to young adults between the ages of 19 and 23 (and even older ages in some regions). The ambition has possibly been to not lose young adults' continuity in dental care in connection with the fact that they may move away from home or have a low income as a result of, for example, studies. But prioritizing based on chronological age goes against the principle of human dignity in the ethical platform. In addition, prioritizing young adults probably also goes against the need-solidarity principle, as young adults generally have relatively better oral health.
It is important to consider that the resources used for this group have an alternative use.

As previously mentioned, there is an opportunity to reprioritize SEK 576 million per year by abolishing free dental care for the age group 19–23 years. The released funds could, for example, be used to expand high-cost protection.

86 Actions with code 815-863 in the reference price list.

How can the high cost cover be extended?

In the previously mentioned scenarios, where resource redistribution is mentioned, the possibility of redistributing the funds to the high-cost protection, without increasing the state's total cost of dental care, is discussed. Given correct risk assessments, it would be possible to re-prioritize resources to individuals with great needs and high costs. Furthermore, a possible investment in measures for disease prevention and cause-oriented treatment is discussed. A report from TLV87 reports that individuals of the same age on average use the high-cost protection to a similar extent regardless of income group. However, it is likely that the high-cost cover in its current form does not reach individuals whose needs and financial challenges are so extensive that they do not have regular contact with dental care, and as experiencing poor oral health is often associated with low income, it is important to take this into account group. A compensation system that takes into account the financial ability of individuals could help this group get the dental care they need.

If more resources are put into high-cost protection, it can be expanded in different ways:

1. Lower limit for when compensation starts to be paid out
2. Greater proportion of the cost that is reimbursed
3. That the high-cost protection is based on each individual's financial conditions
4. More measures are included in the high-cost protection
5. Actual prices instead of reference prices

The first option means that costs under SEK 3,000 start to be covered by the high-cost protection. This is considered to be the easiest to introduce, but as previously mentioned there is a risk that it will lead to overtreatment of low-risk patients.

The second option can be designed in several ways. For example, the subsidy rate could have been increased for specific action codes, or by a certain degree of total expenditure during a period being reimbursed. The challenge will be to identify which action codes should be subsidized further, and to what degree. Alternatively, the challenge becomes identifying how much of an individual's total expenditure can be reimbursed and over what period. Possibly a combination of the variants is desirable.

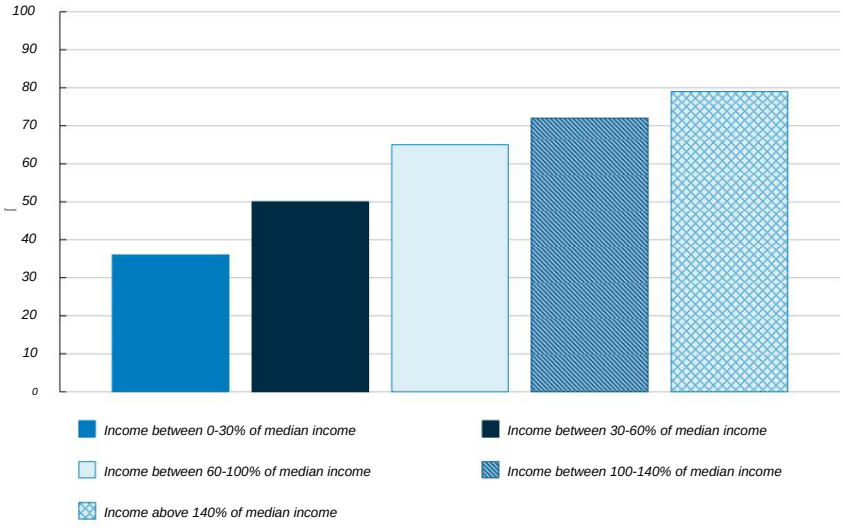
The third option is based on the previous reasoning, but here individuals' costs are related to their financial ability. This would mean that individuals with relatively large dental needs and low incomes receive lower costs. The compensation system would at the same time lead to individuals

[87] Dental and Pharmaceutical Benefits Agency. Current status description of the state dental care support. Reporting of government assignments. Stockholm: Dental and pharmaceutical benefits agency; 2014.

with large odontological needs and high incomes have relatively higher expenses. The challenge is to identify how the subsidy can be designed and how it relates to income.

Alternatives two and three are judged to be the ones that best comply with the ethical platform, but are also the ones that require the most resources to be implemented and maintained, for example through additional work for the Swedish Social Insurance Agency. Figure 1 shows the proportion of individuals who, within each income group, use ATB. The figure shows that those with better financial conditions use ATB to a greater extent compared to those with lower incomes. At the same time, data from TLV indicate that individuals in all income groups use the high-cost protection to a similar degree. Furthermore, good dental health is believed to correlate positively with socio-economic factors, such as higher incomes, especially in relation to caries (Costa et al. 2012)88. Thus, it can be stated that today's compensation model fails based on the ethical platform.

Figure 1. Proportion of recipients of ATB in the population, divided by income groups89



Source: Försäkringskassan

Option four is based on more measures in dental care being replaced by the high-cost cover. Today, not all measures that can be carried out in dental care are automatically included. Option five means that prices that dental clinics set within the framework of free pricing are reimbursed even if they exceed

[88] Costa, Simone M., Carolina C. Martins, Maria de Lourdes C. Bonfim, Lívia G. Zina, Saul M. Paiva, Isabela A. Pordeus, and Mauro H. N. G. Abreu. 2012. ""A Systematic Review of Socioeconomic Indicators and Dental Caries in Adults"" International Journal of Environmental Research and Public Health 9, no. 10: 3540-3574. https://doi.org/10.3390/ijerph9103540.

[89] The intervals in the chart mean that a person with the exact proportion in an interval falls into it higher income group, for example, a person with exactly 30 percent of the median income ends up in the group 30 to 60 percent of the median income.

the reference price list. Both of these options are considered to be less relevant and could lead to less effective methods being used or more cosmetic measures being carried out and financed. Furthermore, reimbursement of actual prices can lead to increased costs for the state.

Common to all alternatives is that any design will require extended analyses.

Incentivesanalysis

Incentives are a name for actions that have the purpose of encouraging a particular behavior. Incentives reward certain behavior and can be of different types. Both individuals and organizations naturally act differently on different types of incentives, but here we analyze how different actors are expected to act based on different conditions. The actors discussed are individuals, dental care providers and the state. The question is: in what direction are the actors expected to act with regard to dental care based on the current situation or a hypothetical change in the state support?

Individuals are expected to be affected by ATB to some extent but mainly by vocations or problems with the teeth. For some individuals, ATB probably works as a way to have regular basic examinations, but these incentives can lead to overuse of dental care for some as they want to use their ATB before it disappears. The individuals who do not know about ATB can be influenced indirectly by the dental care calling for an examination in time so that the individual's ATB can be used. Introduction of governance through risk assessment, as well as possible introduction of the ethical platform, would probably lead to a better proportion between calls for examination and odontological need. It can be argued that the individuals' incentives may not need to be affected, but that they will seek dental care when they need it. However, that assumption places high demands on the individual's knowledge of their oral health.

This requirement is probably too high, especially since each individual's oral health is affected by many factors, such as comorbidity, hereditary factors, diet and cleaning technique. Furthermore, this approach would primarily affect those who today do not have regular contact with dental care.

Economic mechanisms that help them resist frequent screening of low-risk patients could be explored, as well as mechanisms that give them incentives to treat high-risk patients instead.
The reimbursement model could be developed with positive incentives, where dental practitioners who follow national guidelines (when possible) are favored.
Negative incentives, such as reduced compensation for actors who intentionally violate the guidelines, could be an alternative. Legislation, in the form of a dental ethics platform, could be another approach. Possible proposals could also be combined, but the consequences should be further investigated.

Because resources in society are limited, the state needs to have influence over how state resources are distributed. As previously mentioned, based on the ethical platform, the state has taken a position on how resources should be distributed within health care. Although the platform is not directly applied in dentistry, similar reasoning can be used to guide resource allocation in this area. One goal could conceivably be to reduce today's relatively high expenditure by individuals of 57 percent for dental care, and approach the expenditure share that exists today for health care of 13 percent. Based on assumptions that new resources from the state cannot be added, a variant of option three or four, or a combination of these, in the proposals for the extension of high-cost protection could be a start to such a solution. Although the total costs for all individuals may not have decreased in the short term, expenditure in relation to income had decreased for those with the lowest financial ability. Such an effort would be in line with findings from the investigation *When the need must rule - a dental care system for more equal dental health* (SOU 2021:8). On the same theme, it is likely that the state wants those who lack regular contact with dental care to establish it. Partly because it would increase equality, but also because these individuals can be more productive without potential pain, and that they would not need as costly future measures if they received preventive interventions as needed. However, how to reach this group needs further investigation.

Conclusions health economic aspects

The state's expenditure on dental support is approximately SEK 7 billion. Given that this expenditure may not be increased, a goal of dental care based on odontological need for everyone cannot be achieved. However, there are opportunities to make dental care available to the group of individuals who today opt out of dental care for financial reasons. The benefits of making dental care more accessible could eventually lead to a healthier population, which in turn would lead to fewer secondary diseases.

One way to reach this group could be the abolition, or sharp reduction, of ATB together with an extension of high-cost cover.
The data show that such a measure would redistribute resources equally to all income groups90. Deprioritizing ATB could lead to negative consequences such as reduced incentives for preventive care for some individuals, but the positive effect for low-income groups is thought to outweigh.
Furthermore, such reprioritisation had brought dental care closer to the prioritization principles that apply in health care.

[90] Dental and Pharmaceutical Benefits Agency. Current status description of the state dental care support. Reporting of government assignments. Stockholm: Dental and pharmaceutical benefits agency; 2014.

In summary, this analysis has identified opportunities for designing a future reimbursement system that makes dental care more similar to health care without new funds being distributed from the state. However, the design of the compensation system needs further investigation. Below is a summary of some questions that could be further analyzed in such an investigation.

1. Should the reimbursement model shift to retrospective payment of benefits until there is a validated disease risk assessment method?
   - It would probably mean a downgrading of ATB, which today is a type of prospective compensation model. This would probably minimize the degree of incorrect payments based on dental need.

2. Should the subsidy rate for disease prevention treatment and cause-oriented measures increase?
   - It would probably lead to individuals being able to use dental care earlier and thus in the long run avoid extensive and costly measures.
3. Should the subsidy rate within the high-cost protection increase for the individuals who have the highest expenses for dental care in relation to their income?
   - It would probably lead to more people who have great needs and expenses seeking dental care. Such a measure would benefit the group that currently lacks regular contact with dental care.
4. Should control of dental practitioners through financial incentives or through legislation be introduced?
   - It would probably lead to a reduction in incorrect payments, but at the same time require a lot of resources to implement.

Prerequisites for a national model for risk assessment in dentistry
(article no. 2024-4-9000) can be downloaded from socialstyrelsen.se/ publikationer.