The School as an Arena for Oral Health Promotion

Eva Hedman

Department of Cariology
Institute of Odontology, Sahlgrenska Academy
University of Gothenburg
Göteborg, Sweden

UNIVERSITY OF GOTHENBURG

Gothenburg 2012

Abstract

The School as an Arena for Oral Health Promotion

Eva Hedman, Department of Cariology, Institute of Odontology, Sahlgrenska Academy, University of Gothenburg, Box 450, SE-405 30 Göteborg, Sweden.

Objective*:** This thesis focuses on the school as an "arena for oral health promotion". The overall aim was to describe adolescents' and dental professionals' knowledge of and attitudes to oral health and oral health promotion. In addition, the aim was to implement an intervention programme in Swedish secondary schools. ***Design: Both quantitative (Papers I and III) and qualitative research methods (Papers II and IV) were used. Paper I was a baseline survey, based on a questionnaire distributed in schools about knowledge of and attitudes towards oral health among adolescents in grades 6 and 9 (n=793). Paper II was performed as an individual interview study carried out by nine dental hygienists and nurses. The interviews were analysed in accordance with the principles of the discourse method. In Paper III, an experimental longitudinal intervention study based on 534 adolescents in grades 6-9 was evaluated. The intervention group was given education for two years and offered preventive measures, such as fluoride varnish treatment every six months, while the control group received no intervention. A questionnaire about knowledge of and attitudes towards oral health and tobacco was used and caries incidence and progression were assessed on bite-wing radiographs. Paper IV was an interview study based on three focus groups with adolescents from the intervention study. The interviews were analysed according to a phenomenographic approach. ***Results:*** The results of the questionnaires used in Papers I and III showed that the adolescents regarded their oral health as important. Their knowledge of oral hygiene was good, but when they were asked to explain terms relating to oral diseases was limited. Girls had more knowledge than boys, 15- year–olds more than 12-year-olds while natives of Sweden had more knowledge than those with an immigrant background (Paper I). Dental hygienists and nurses in Paper II expressed a desire to work with health promotion, although their approach differed, as some asked for interaction with adolescents, while others preferred more traditional methods based on one-way communication. When it came to caries development after the two-year oral health intervention, fewer individuals had developed enamel caries compared with the control group (p=0.002), but no differences concerning dentine caries could be found. The preventive fraction was estimated to be 50% (Paper III). In Paper IV, the adolescents stated that the oral health programme had given them a feeling of control over their own oral health. The fluoride varnish treatment performed in groups was experienced differently by the adolescents. For some adolescents, the group treatment appeared a feeling of security, while others expressed a sense of vulnerability. ***Conclusion***: These series of studies demonstrate that oral health promotion carried out in secondary schools is an interesting approach when it comes to preventing enamel caries and to providing an insight into adolescents' and dental staffs' attitudes to both oral and general health, including smoking habits.

Key words: Adolescents, Dental caries, Oral health promotion, Prevention, Secondary school Sweden.

ISBN 978-91-628-8541-0 e-publish http:// hdl.handle.net/2077/30261

eva.hedman@lul.se

Contents

Original papers

This thesis is based on the following four papers, which will be referred to in the text by their Roman numerals (I-IV):

I. Hedman E, Ringberg K, Gabre P. Knowledge of and attitude to oral health and oral diseases among young adolescents in Sweden. Swed Dent J, 30:147-154, 2006.

II. Hedman E, Ringberg K, Gabre P. Oral health education for schoolchildren: a qualitative study of dental care professionals' view of knowledge and learning. Int J Dent Hygien, 7:204-211, 2009.

III. Hedman E, Gabre P, Birkhed D. Dental hygienists working in schools - a two-year oral health intervention program in Swedish secondary schools. Submitted for publication.

IV. Hedman E, Gabre P, Birkhed D, Lepp M. Adolescents' experiences of a two-year oral health intervention program in Swedish secondary schools. Submitted for publication.

Abbreviations and definitions

The following terminology is used in this thesis:

Caries incidence = Caries free surfaces that turn into enamel lesions, dentin lesions or fillings in a specific time

Caries progression = Enamel lesions that proceed to dentin lesions or fillings in a specific time.

D_1Sa = Approximal caries lesion in the outer half of the enamel (level 1)

D_2Sa = Approximal caries lesion more than halfway through the enamel but not passing the enamel-dentine junction (level 2)

D_3Sa = Approximal caries lesions extending into dentine (level 3)

$D_{1+2+3}FSa$ = Approximal enamel and dentine caries lesion on level 1+2 +3 and fillings

D_3FSa = Approximal dentine caries lesions and fillings

.

Introduction

For many years, I have worked as a dental hygienist, focusing on oral health promotion for children and adolescents within the Public Dental Service in Uppsala County, located north of Stockholm, Sweden. A total of 340,000 people live in this region. The perception of health and health promotion has changed during this period and has added new and interesting approaches to the work. The Dental Act (Ministry of Health and Social Affairs, 1985), with the emphasis on heath promotion and people's right to information, self-determination and participation, imposes greater demands on the dental hygienists pedagogic approach. Oral health promotion is a complex area in which the individual's own ability for self-care and influencing their health is emphasised. The dental hygienist should promote health through communication and dialouge and support the patients' knowledge, will and ability. The social and pedagogic perspectives are clearly represented in the work, in combination with the dental and medical perspectives.

The focus of this dissertation is the school as an "arena for oral health promotion". Children and adolescents spend thousands of hours during their childhood in the school environment, making the school an useful place for promoting oral health (St Leger and Nutbeam, 2000). Adolescence is also a period in life when health-related behaviours, beliefs and attitudes are formed by outside influences and good oral health habits are important in order to establish positive long-term oral health (Kelder et al., 1994; Kuusela et al., 1997). Intervention programmes that focus on the whole school as a context rather than on the individual have been successful in preventing different unhealthy behaviours, like smoking and the use of alcohol. They have also shown that health promotion in schools, in addition to health benefits, scored well in terms of cost effectiveness (St Leger and Nutbeam, 2000; Sellström and Bremberg, 2006).

Health and oral health, what does this mean?

The term "health" is a central concept for most professions within health care, which also includes dental care. Two commonly used descriptions of the concept of health can be found. One is based on the biomedical approach focusing on disease treatment and prevention. The other approach, the salutogenic, focuses on the whole individual and is based on preserving health, which requires an action-oriented perspective that recognises the interplay between individual and environment (Lerner et al., 1994; Antonovsky, 1996). The World Health Organisation

(WHO, 1947) defined health as a "state of completed permanent physical, mental and social well-being and not merely absence of disease or infirmity". This definition has been criticised and described as being too utopian, but it has also been commended for defining health from two perspectives, the individual and the professional. Many attempts have been made to update the definition. In the Ottawa Charter (WHO, 1986), health is described as a resource in everyday life, a positive concept emphasizing social, physical and mental ability. In recent years, there has been an intense debate about the reassessment of the health concept, where the goal is a more dynamic and functional layout of the concept (Jadad and O'Grady, 2008). One proposal that has been put forward is to define health as the ability for adaptation and self-management (Huber et al., 2011). Health can be experienced by the individual despite disease and it is important to understand that health is a subjective experience, which varies from situation to situation (Nordenfelt, 1991; Strandmark, 2007).

The concept of oral health includes both the absence of illness and the individual's own description of well-being and health (Kay and Locker, 1998). Oral health is fundamental to general health and well-being and has an impact on quality of life (Silva et al., 2008). The majority of oral diseases are related to socio-economic factors and daily living habits and it has also become clear that risk factors in oral diseases are often the same as those implicated in general diseases (WHO, 2003; Silva et al., 2008).

Health promotion

Health promotion, as defined by the Ottawa Charter (WHO, 1986), refers particularly to the process of enabling people to increase control over the determinants of health. The implementation of this definition requires a focus on health factors with a perspective on the whole individual (Antonovsky et al., 1991). Health promotion conducted in collaboration with other players, and on several levels, can promote good health development and health equality for many children and adolescents (Nilsson et al., 2006).

Health promotion is a concept, where health is seen as a resource that is maintained and promoted by healthy choices. The importance of social, political and environmental determinants of oral health is stressed and according to the Ottawa Charter (WHO, 1986), the strategies include creating supportive environments and community actions, building healthy public policies, and

developing personal skills and re-orienting the health services into a shared responsibility for health between the society and the individual. Health education, prevention and health protection are central parts of the health promotion concept (Downie et al., 1996) (Fig. 1).

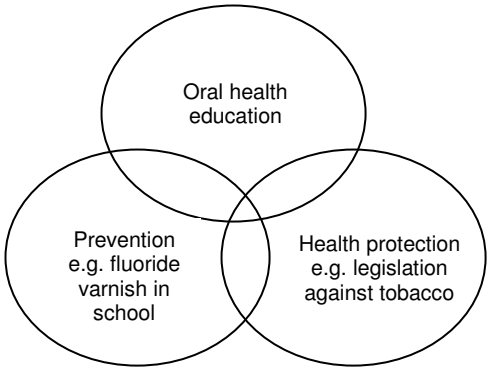

Fig 1. Model for oral health promotion modified from Downie et al. (1996)

Empowerment and self-esteem

The concept of ”empowerment” has attracted increasing interest in health promotion and focuses on people’s own abilities and desires to control their lives (Berg and Sarvimaki, 2003). Empowerment in health promotion can be seen as a supportive process with the emphasis on collaboration (Crane-Ross et al., 2006).

> Empowerment is an approach, which enables people to take charge of their lives, including changing their behaviour if they so wish. It inevitably involves a reduction in professional dominance and control (Naidoo and Wills, 2000).

High self-esteem and a sense of control are strongly linked to empowerment. Those with high self-esteem are likely to be more receptive to messages that focus on taking good care of themselves (Tones and Tilford, 2001). Voluntariness and autonomy are focal points in the educational process; learners need knowledge of and insight into their values and attitudes before they can make free choices. Instead of telling people what to do, the health educator needs to identify needs and to work towards an informed choice, even if this may lead to health-damaging behaviour (Naidoo and Wills, 2000). In the context of care, empowerment means helping people develop ability, will and tools. Group discussions and valuation methodology can be combined with more traditional pedagogic methods as a way of achieving goals. In the literature, two types of empowerment, personal and society are described. Personal empowerment includes the individual’s power and ability to control and change his/her life and actions. Society empowerment is a concept whereby people, individually or with others, acquires the ability and

tools to affect the social conditions that influence their lives. Empowerment can be seen as a question of democracy, to increase ability and willingness to participate in and influence the democratic process and community development (Tones and Tilford, 2001).

Health education

Health education is an important tool for healthy choices, behavior and the ability for self-care (Downie et al., 1996). The definition of health education can be described as a varied set of strategies to influence both individuals and their social environments with the aim of improving health behavior, and to enhance health and quality of life (Glanz et al., 2008). Traditionally, health education has been given in the form of information and advice (Freeman, 1999) with the idea that information can modify people's attitudes to a behavioral change. With this approach, the caregiver more or less persuades the patient to change his/her behaviour and may also create a passive patient rather than an active partner (Jönsson et al., 2012).

Studies of school-based educational intervention programmes have produced mixed results (Kay and Locker, 1998; Coleman et al., 2004; Flay, 2009). Comprehensive strategies, with the core aim of changing the attitudes, knowledge and behaviour of the adolescents within the context of a social environment, have generally been found more effective than information-based interventions that have produced limited or no effects (Backinger et al., 2003). Other methods and approaches that affect people's health are those that help people to clarify their values, build their confidence and increase their ability to make decisions. Examples of these methods include active valuations and valuation methodology (Steinberg,1994; Naidoo and Wills, 2000; O'Dea and Abraham, 2000).

There are several theories describing factors and conditions relevant to understand attitudes and behaviour in health promotion. The most commonly used theories in the research of oral health behaviour are the Theory of Planned Behaviour (Ajzen, 2011), the Cognitive Theory (Bandura, 1986) and the Model of Stage of Change (Greene et al., 1999). Many studies describe how attitudes influence the individuals' actions and thoughts (Ajzen and Fishbein, 1980; Nilsson et al., 2006). The integration of attitudes in the assessment of oral health intervention is therefore of primary interest. Attitudes appear to be related to oral health behaviour and according to Ajzen

and Fishbein (1980), they are a kind of theoretical entity that can play an important role in the way people think and behave.

Prevention and preventive factors

Prevention supplements the concept of health promotion and the aim of prevention is to identify risk factors and prevent diseases (Kannel et al., 1961). A risk factor is a factor or event that increases the risk of illness or disease. Synonymous, the term "determinant" is used in the epidemiology. The relationship between a risk factor and a certain outcome is often not that clear. Risk factors can be found at many different levels, i.e. in individual behaviour, in the family, neighbourhood or community. They can interact with one another, together or individually, and increase the risk for illness (Ylostalo et al., 2004). Measures aimed at the entire population with the aim of preventing illness before the disease occurs are called "primary prevention". "Secondary preventive" measures are aimed at a defined risk group or individual in order to prevent disease. Within "tertiary prevention" steps to limit illness or further disease are taken in already affected individuals (Lagerberg and Sundelin, 2000). The opposite of risk factors are healthy or protective factors that have the ability to prevent illness or disease. This approach is inspired by the salutogenic model, a model that focusing on social and environmental determinants of health and people's own resources and capacity to promote health.

Health protection

Health protection comprises actions of all kinds on the part of society such as establishing laws and policies and implementing economic measures, such as increased taxes on tobacco, with the aim of reducing illness and stimulating health. Since 2003, Sweden has a public health policy consisting of eleven target areas designed to create the social conditions for good health on equal terms for the entire population (Ministry of Health and Social Affairs, 2002).

Despite increased welfare in Sweden, there is still social inequality in health. Smoking is a main health risk. The national Board of Health's report (2009) stressed that socio-economic conditions area very strong risk factor for disease and death. Age, gender and education levels must also be considered in descriptions of public health. Mental illness is more common among younger people, especially among females. More than half of the males and over one third of females (aged 16-74

years) are overweight or obese. There is a clear difference in living conditions between native-born people and immigrants, who also to a greater extent describe their general health as poor (National Board of Health and Welfare, 2009). Education level is a factor that is associated with people's well-being and health. Furnee et al. (2008) stated that many aspects of life that make people unhappy are more prevalent among people with a lower educational level compared to those with a higher competence. People with low education, experience health problems more frequently than highly educated people and are more likely to smoke, drink alcohol and be overweight and obese. Unemployment is generally higher among people with low education than among those with a higher education level (Furnee et al., 2008). Just as age, education and social differences must be considered in descriptions of public health, gender is another factor. There are differences that depend on different living conditions among males and females that could explain several of the differences in health outcomes (National Board of Health and Welfare, 2009).

Adolescence

The word "adolescence" means "growing up" and describes a transitional period between childhood and adulthood. This period is mostly associated with the teenage years, often set at between 10 to 20 years of age, although its physical, psychological and cultural expressions can begin earlier and end later. The period of adolescence includes cognitive, affective, social and moral development and can be described as a period of personal development when the young person forms his/her personal identity. It is mostly a period of good health, and the cognitive development is rapid (Smith, 2007). Adolescence can be described as a stage of life in which the individual thoughts start taking more of an abstract form and egocentric thoughts decrease (Silverman, 1980). This allows the individual to think in a wider perspective (Vetter et al., 2012). Adolescence can be divided into three stages: early, middle and late adolescence, where early adolescence is characterised by rapid bodily growth and development. Middle adolescence is marked by a more obvious ability to think abstractly, the desire to dissociate from parents is clear and social acceptance of fitting into peer groups is strong. Late adolescence is marked by a more matured ability to think on even higher abstract levels. Cognitive development interacts with increased experience, knowledge and changing social demands. The age at which particular changes take place, varies widely. Puberty begins earlier for girls than for boys, but both genders tend to complete development at approximately the same age (Juul et al., 2006). The period of adolescence appears to be suitable for oral health promotion, as habits, behaviours and attitudes established during this period are likely to be maintained in the future and can thus ensure long-term oral health. Cognitive, moral and social capacities increase

throughout this period and this is important when planning health promotion at school (Smith, 2007).

Oral diseases

Oral disease involves several conditions and diagnosis such as dental caries, periodontal disease and mucosa lesions. In this thesis focus is on dental caries and to some extent periodontal diseases. Dental caries is a multifactorial disease with a number of factors contributing to its initiation and progression. They include the frequent intake of fermentable carbohydrates, poor oral hygiene and high counts of cariogenic microorganism. The progress of caries is slow in most people and it is also reversible in its early stages (Selwitz et al., 2007). The risk of developing new carious lesions and the progression of existing lesions are most pronounced during the first years after the eruption of the permanent teeth, i.e. 12-15 year of age, and less pronounced in older adolescents. The progression is also faster in dentine compared with enamel (Mejàre et al., 1999).

Caries is still a problem for individuals and society. According to the WHO, 60-90% of schoolchildren worldwide suffer from dental caries (WHO, 2007). Dental caries among children and adolescents in Sweden has been continuously reduced over the past 40 years. The greatest improvement occurred in the 1970s, while during the1990s and the 2000s, limited improvements could be seen. Instead, a slight deterioration in dental caries has been observed among certain groups in society (Wennhall et al., 2002; Welfare and Scully Cbe, 2006). Despite improvements, the majority of Swedish children and adolescents suffer from caries and this is especially clear when enamel caries is included (Moberg Sköld et al., 2005a; Alm, 2008; Hänsel Petersson et al., 2012).

Approximately 10-15% of children and adolescents have major problems with tooth decay, a percentage that has remained unchanged for a long time (Nishi et al., 2002). The risk of developing dental caries, like the risk of starting to use tobacco among children and adolescents, is strongly related to poor socio-economic and lifestyle factors (Sakki et al., 1995; Ylostalo et al., 2004). Parents' educational level and migrant background are especially important (Skeie et al., 2005).

Methods for preventing dental caries in children and adolescents

A ”triad” of factors is needed for caries to develop. They are 1) the substrate (diet), 2) the microflora (dental plaque), and 3) the host (teeth, saliva) (Keyes 1962; Lingström et al., 2003). Dietary habits are an important factor for oral health and the high consumption of sucrose is associated with the initiation and progression of caries (Paes Leme et al., 2006). Johansson and Birkhed (1994) stress that the dietary behaviours that promote oral health is above all to avoid eating between meals and to restrict the products that contain sugar, especially sucrose. Several other studies have showed that the frequency of intake per day is dominating in the development of caries (Beighton et al., 1996; The National Board of Health and Welfare, 2011).

Oral hygiene is also a factor of importance in preventing caries, especially when combined with fluoride toothpaste. In the preventive process, toothbrushing has two effects; 1) reducing the number of cariogenic microorganism, such as mutans streptococci and lactobacilli that produce acid on the tooth surface, and 2) carrier of fluoride toothpaste. The acids cause a pH-drop below critical levels, resulting in the demineralisation of the tooth surface (Featherstone, 2004).

Regular dietary habits and the use of fluoride are the foundations of caries prevention. The effect of fluoride on caries incidence and progression is well documented (Featherstone, 2000; Marinho, 2009). The daily use of fluoride toothpaste twice a day is an effective method for preventing caries in permanent teeth (Marinho et al., 2003).The use of fluoride toothpaste may be the main reason for the caries decline in developed countries (Bratthall et al., 1996; Julihn et al., 2006). The best caries reducing effect in children and adolescents is produced by using toothpaste containing at least 1000 ppm fluoride and the preventive effect improves as the fluoride concentration increase (Walsh et al., 2010; SBU, 2002). The daily use of 0.2% NaF solution, fluoride gels in individual traces and high-fluoride toothpaste (5000 ppm) are other effective methods for preventing caries (Nordström and Birkhed, 2010; The National Board of Health and Welfare, 2011). Fluoride can also be supplied through fluoride lozenges and chewing gum, although these are less effective and are recommended only in special cases, e.g. in connection with a dry mouth (The National Board of Health and Welfare, 2011). Fluoride varnish treatment, at dental clinics or in schools, is another common and effective preventive method. The advantage of this method is the long contact time between the applied varnish and the tooth surface. The varnish also releases fluoride into the oral environment in

order to inhibit demineralisation and enhance remineralisation (Petersson, 1993). In addition, the varnish is well tolerated by patients (Petersson, 1993; Bawden, 1998; Moberg Sköld et al., 2005b).

The use of tobacco

It is known that tobacco use represents the single greatest health risk in Sweden, and is also the cause of health disparities between different population groups. In the public debate a picture of increasing differences in health among children and adolescents emerges. The results from different studies (Galanti et al. 2001, Uppsala County Council, 2011) reveal that girls in high school are the group that smokes most, 12% compared with 10% of the boys.

The period of adolescence is characterised by being a curious seeker, challenging the boundaries and it is not always easy to foresee the consequences of various choices and decisions, such as starting to smoke or use snuff (Galanti et al., 2001). Testing is part of teenage development and may be a way to explore what is forbidden. Encouraging young people who have never tried snuff or cigarettes to remain tobacco free and influencing those who experiment with tobacco to quit are essential factors in promoting health.

In the oral cavity, the negative effects of tobacco use are numerous and have been extensively studied for a long time. Among other things, studies reveal an association between smoking and periodontal disease and that smoking reduces the treatment results (Tomar and Asma, 2000; Bergström, 2005). In addition, a correlation between increased frequency of tobacco use and calculus formation has been shown (Bergström, 2005). Tobacco use is also associated with several changes in the oral mucosa, ranging from innocent reversible damage to oral cancer (Merne et al., 2002). Bone loss is more prevalent among snuff users than non-snuff users, as well as exposed root surfaces caries, wear to the chewing surfaces and discoloured teeth (Rosseel et al., 2010). In addition, smokers often have bad breath, and poor taste as the small salivary glands are destroyed (Kleinman et al., 1994). The relationship between caries and tobacco use is, however, not well established (Vellappally et al., 2007, Hugoson et al., 2012).

Methods for preventing tobacco use in children and adolescents

There is no simple ways of keeping young people from using tobacco. Smoking and snuffing is a complex process that includes different factors at both social and individual levels (Rosendahl et al., 2005). Tobacco prevention has historically been based on information and giving advice with

the emphasis on knowledge of the negative health effects of using tobacco. However, such programmes have showed little effect (Thomas and Perera, 2006). Today, interventions based on broader psychosocial concept appear to be more frequently used in tobacco prevention for young people, and this is also recognised as one of the most successful methods (Nilsson et al., 2006). Programmes that use cognitive behavior and comprehensive strategies also have the best effects on reducing adolescent smoking in the long term (Hwang et al., 2004). There is a growing understanding that knowledge alone is not enough to change behavior. Instead, knowledge must be combined with training of individual abilities, awareness and shaping of social norms (Nilsson et al., 2006).

Oral health promotion in Sweden

Health promotion in Sweden is based on the Health Care Act and the Dental Act (Ministry of Health and Social Affairs, 1982, 1985), which is the framework that includes goals and guidelines of the Swedish health care. These laws emphasise the importance of health promotion and preventive care:

> The target for dental care is good dental health and dental care on equal terms for the whole population. Dental care should be provided in such a way that it complies with the requirements for good dental care. This means that it should be of high quality and focus primarily on preventive measures. The health-oriented, salutogenic perspective means focusing on health-promoting factors and on a holistic approach to human beings

Dental care services encounter most of the population, both in connection with regular check-ups and activities outside the clinic, e.g. in schools, preschools and child centres, and this offers unique opportunities to contribute to health improvements. A shift has taken place in oral health promotion approaches and it has been inspired by the salutogenic model. The main focus was previously on reducing oral diseases, but the focus today is instead on social and environmental determinates of health that are likely to improve oral health in individuals and populations (Watt, 2007).

In the 1990s, poor dental health affected only a small proportion of children and adolescents, and therefore the dental care services shifted from a population-oriented health promotion, targeting all children and adolescents, to an individual high-risk strategy. A high-risk strategy means that children and adolescents who have multiple risk factors are identified and only they are the object

of extra efforts to prevent oral diseases. However, research shows that this is not an effective method to reduce the incidence of the disease. As there are so many more children and adolescents running a small risk compared with the risk individuals, most new carious lesions still occur in the healthy group (Rose, 2001). The most effective way to reduce caries incidence is therefore to invest in population-based interventions. Efforts made at school offer all children and adolescents the chance to share in a natural way and the adolescents with the greatest needs reap the greatest benefits (Moberg Sköld et al., 2005b).

Oral health promotion in the county of Uppsala

Since the 1970s preventive dental care in the county of Uppsala has focused on health promotion at schools. Originally, these activities consisted primarily of oral hygiene instructions and fluoride rinsing in school. As oral health has improved, the extent of fluoride rinsing decreased and actions in schools instead consisted of health promotion messages.The preventive dental care in the County of Uppsala is designed according to specific guidelines addressed at all children aged between 0-19 years. The goal is to help people to retain oral health and can be understood in the context of the county council's objective of promoting public health (Uppsala County Council, 2012). The guidelines consist of an individual health risk assessment and information/education about dental diseases, diet, tobacco, fluoride use and oral hygiene at school and in the dental clinic. The guidelines on how to prevent tobacco use focus partly on the epidemiological registration of daily tobacco use and partly on offering all tobacco-consuming individuals aged between 12-19 years a motivational dialogue about tobacco use in relation to oral health.

Risk assessment

All children and adolescents in the county are assessed for the risk of developing dental diseases. This risk assessment is performed by dentists and dental hygienists and is based on the patients' individual history, where social, medical and oral conditions are considered, and the clinical examination. Salivary and microbiological analysis can complete the assessment if necessary, as well as a structured diet analysis. Patients are grouped on three levels: healthy, low risk and high risk (Fig. 2).

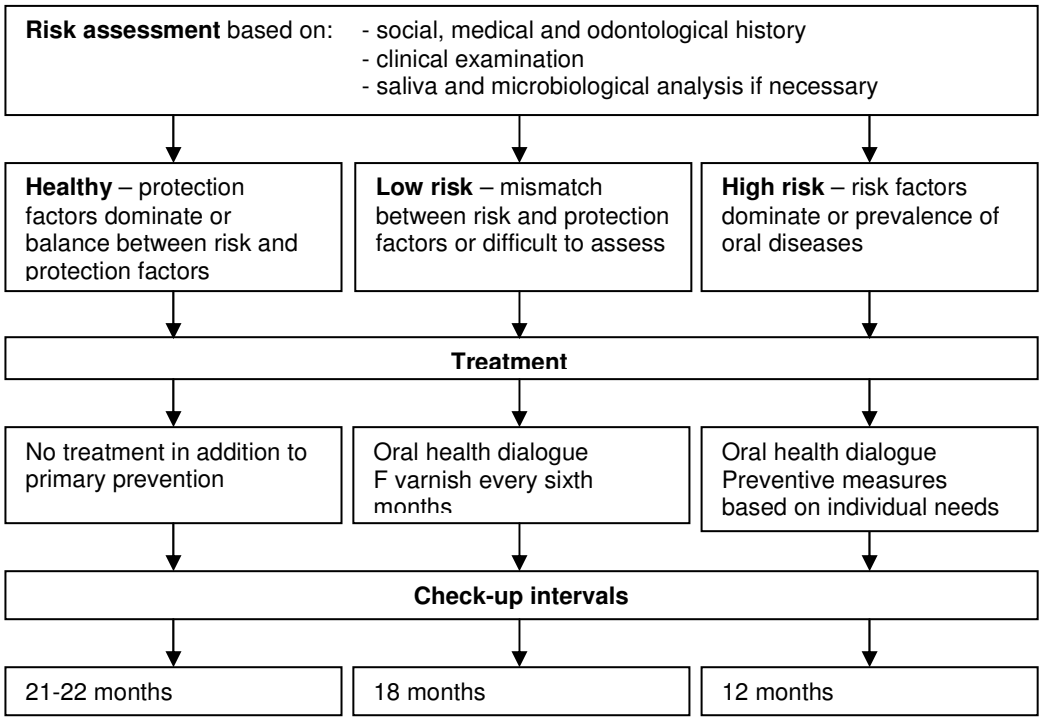

Fig 2.Guidelines for individualised dental care for children and adolescents (2-19 years) in Uppsala County.

During the risk assessment, a number of risk and protective factors can be identified. When the protective factors dominate, or if there is a balance between them, the individual can be regarded as healthy. No preventive measures apart from the health promotion aimed at all individuals performed at schools are offered. The interval between the regular check up can be 21-22 months. Individuals assessed as running a low risk have fluoride varnish treatment every six months and the interval between check-ups does not exceed 18 months. Those with dominate risk factors are regarded as high risk individuals and they are offered an individually based preventive programme. Their interval between regular check-ups should not exceed 12 months. Approximately 70% of all children and adolescents belong to the "healthy" group while there are 10% in the "high risk" group (Fig. 2).

Oral health education

Oral health education is an important part of health promotion and is addressed at all children and adolescents 0-19 years of age (Table.1).

Table 1. Primary prevention relating oral health for children and adolescents in Uppsala County

Age	Location	Giveaways	Description
8 months	Child health center	Toothbrush Brochure	Oral health dialogue with parents, individually or in groups, using educational materials
2 years	Dental clinic	Toothbrush Brochure	Oral health dialogue with parents individually using educational materials
6 years	Preschool	Toothbrush Hourglass Brochure	Oral health dialogue with children and teachers in groups using educational materials. In some areas rinsing with F solution regularly
9 years	School	Toothbrush	Oral health dialogue with children and teachers in classroom using educational materials. In some areas rinsing with F solution regularly
12 years	School	Toothbrush	Oral health dialogue, including tobacco information, with children and teachers in classroom using educational materials. In some areas rinsing with F solution regularly
15 years	Dental clinic	Dental floss	Instruction on the use of dental floss,

The education in school focuses on health and lifestyle and the relationship between oral health and general health. The aim is to start discussions in the classroom, reinforce and create interest in health promotion among the pupils. The education of the younger children, 6-12 years, is based on imagination, improvisation and play in combination with facts. A magic kit with glitter cloths, tooth goblins, Dracula teeth and toothbrushes stimulates play and chatter among the younger children.A model of teeth, photos, a tube of cigarette butts illustrating one year's consumption and a wallet with money showing the high cost of using tobacco are used to spark interest about the effects of tobacco on general health and oral health among the older adolescents.

Intention for this thesis

Although health promotion in the County of Uppsala is well structured, there is scope for development. Today, the threats to health are numerous and our daily living habits has changed dramatically. In western countries, unlimited access to food and more leisure time without physical activity is conductive to frequent eating. Many children and adolescents, obtain a large part of their energy from candy, soft drinks, ice cream and pastries and the sweet foods are consumed two to three times a day on average (National Food Agency, 2003). Changes in family patterns with fewer opportunities to eat together also increase the likelihood of more frequent

eating. Based on the new trends in consumption, it is important to strengthen and develop every aspect of health promotion and the introduction of preventive programmes oriented towards both populations and individuals.

Society has the main responsibility for health protection, while dentistry has a great potential as a result of working with health education and prevention, preferably in collaboration with schools. The general hypothesis of this thesis is therefore that oral health promotion in schools conducted by dental professionals can affect adolescents' oral health.

General aim

The overall aim of this thesis was to describe adolescents' and dental professionals' knowledge of and attitudes to oral health and oral health promotion. In addition, the aim was to implement an oral health intervention programme in Swedish secondary schools.

The specific aims of this thesis were to:

- investigate the knowledge of and attitudes to oral health among 12 and 15-year-old adolescents in Sweden,

- describe and interpret dental professionals' view of knowledge, learning, health promotion and their expectation of and attitudes to the response from school children,

- study the possibility to influence adolescents' caries incidence, knowledge of and attitudes to oral health and tobacco use through a school-based oral health intervention programme, and

- describe adolescents' experiences of participating in a school-based oral health programme for two years.

Methods

Both quantitative (Papers I and III) and qualitative (Papers II and IV) research methods were used. All the studies were conducted in Uppsala County, Sweden. This county is situated in central Sweden and has about 340,000 inhabitants. Uppsala is the main city with approximately 200,000 inhabitants, and the area around Uppsala has several medium and small–sized towns. An overview of the study design, sample, measurements and statistics is presented in Table 2. In paper I, III and IV the subjects are pupils in secondary school and in this thesis they are called adolescents. All the studies were approved by the Regional Ethical Review Board at Uppsala University.

Table 2. Overview of study design, sample, measurements and analysis methods

Paper	Sample	Measurements	Analyses
I) Baseline survey	793 adolescents grades 6 and 9	Questionnaire	Descriptive Bivariate statistic analysis
II) Qualitative	Nine dental hygienists and dental nurses	Individual interviews	Discourse method
III) Experimental intervention	534 adolescents grades 6-9	Clinic measurements and questionnaire	Descriptive Bivariate statistic analysis
IV) Qualitative	16 adolescents	Focus group	Phenomenography

Paper I

Aim and design

The aim was to investigate the knowledge of and attitudes to oral health among 12- and 15-year-old adolescents in Sweden and was designed to act as a baseline survey based on a school questionnaire answered by a group of adolescents in grades six and nine. The data were collected in 2002.

Subjects and procedure

Adolescents, in compulsory schooling made up the sample framework. From all 85 schools in the County of Uppsala, ten were randomly selected. At each school, two sixth grade (12-year-old adolescents) and two ninth grade (15-year-old adolescents) classes were selected at random. The adolescents and their parents were informed of the study by a letter and were able to accept or

refuse participation in the study. In all, 993 persons were offered the chance to participate in the study and 793 individuals agreed to participate (80%).

Questionnaire

A questionnaire with fifteen structured questions and with pre-choice alternatives was used (Appendix 1) with questions about the adolescents' knowledge of and attitudes to oral health. The adolescents answered the questionnaire anonymously during a lesson at their school in the presence of a dental professional. The questionnaire was constructed in co-operation with a dentist and a dental hygienist with experience of oral health issues and was used in a previous study performed in 1998 (Hedman, 1998). As a result of that study two questions were excluded and three were modified in the questionnaire used in this study.

Paper II

Aim

The aim was to describe and interpret dental professionals' view of knowledge, learning-and health promotion and their expectation of and attitudes to the response from school children.

Study design

A qualitative study design was used, in accordance with the principles of the discourse method. This analysis method stresses the variation and distinctions in the statements.The data were collected in 2002 and the questions were: How do people talk about oral health education? What essential concepts do they focus on and what do they omit? What thoughts, expectations and views of knowledge appear in the interview text? Data from the interviews were analysed using content analysis in accordance with the discourse method (Potter and Wetherell, 1987). The purpose was to find patterns in already existing circumstances instead of interpreting an underlying meaning (Eglin and Hester, 2003). The question: "What are people talking about?" leads to a concentration of content and structure, but the question: "What are they not talking about? also serves the same purpose. Cherryholmes (1993) states that the purpose of reading a text is to find all the possible meanings rather than finding the actual meaning. To avoid unessential or overly extensive elements in the discourse, the framing of the questions and their relationship to the interview text formed a structural instrument for analysis (Fairclough, 1992). The interviews were performed in Swedish and transcribed in Swedish. A professional translator translated the quotations from Swedish to English.

Subjects and procedures

Nine dental hygienists and dental nurses, who have practised oral health education among school children aged 6-16 years, described their work in semi-structured interviews. To provide a broad range of different views related to the study aim, the study sample consisted of dental hygienists and dental nurses with different educational levels, of different ages and with different periods of experience of oral health education (Table 3). The focal point was on the informants' own description of education and their thoughts and actions in relation to oral health education. All the interviews were conducted by a dental hygienist (EH) and lasted for approximately one hour. They were conducted locally at the office of the Department of Preventive Dentistry or, in some cases, at the subject's place of work. The interviews were tape-recorded and transcribed verbatim by a secretary who was otherwise not associated with the study. All the dental staff (14 subjects) involved in school education were offered the chance to take part in the study and nine agreed to participate.

Table 3.The distribution of professional education and years in the profession among the informants.

Informant	Professional education	Years in profession
1-4	Dental nurse/hygienist	21-22
5	Dental nurse	30
6-9	Dental hygienist	3-8

Paper III

Aim and study design

The aim was to study the ability to influence adolescents' caries incidence, knowledge of and attitudes to oral health and tobacco use through a school-based oral health intervention programme. The study had an experimental longitudinal intervention design with test and control groups. Four schools with specific characteristics were selected and the schools were randomised to intervention and control groups as randomisation of individuals was not possible for practical reasons (Fig. 3).

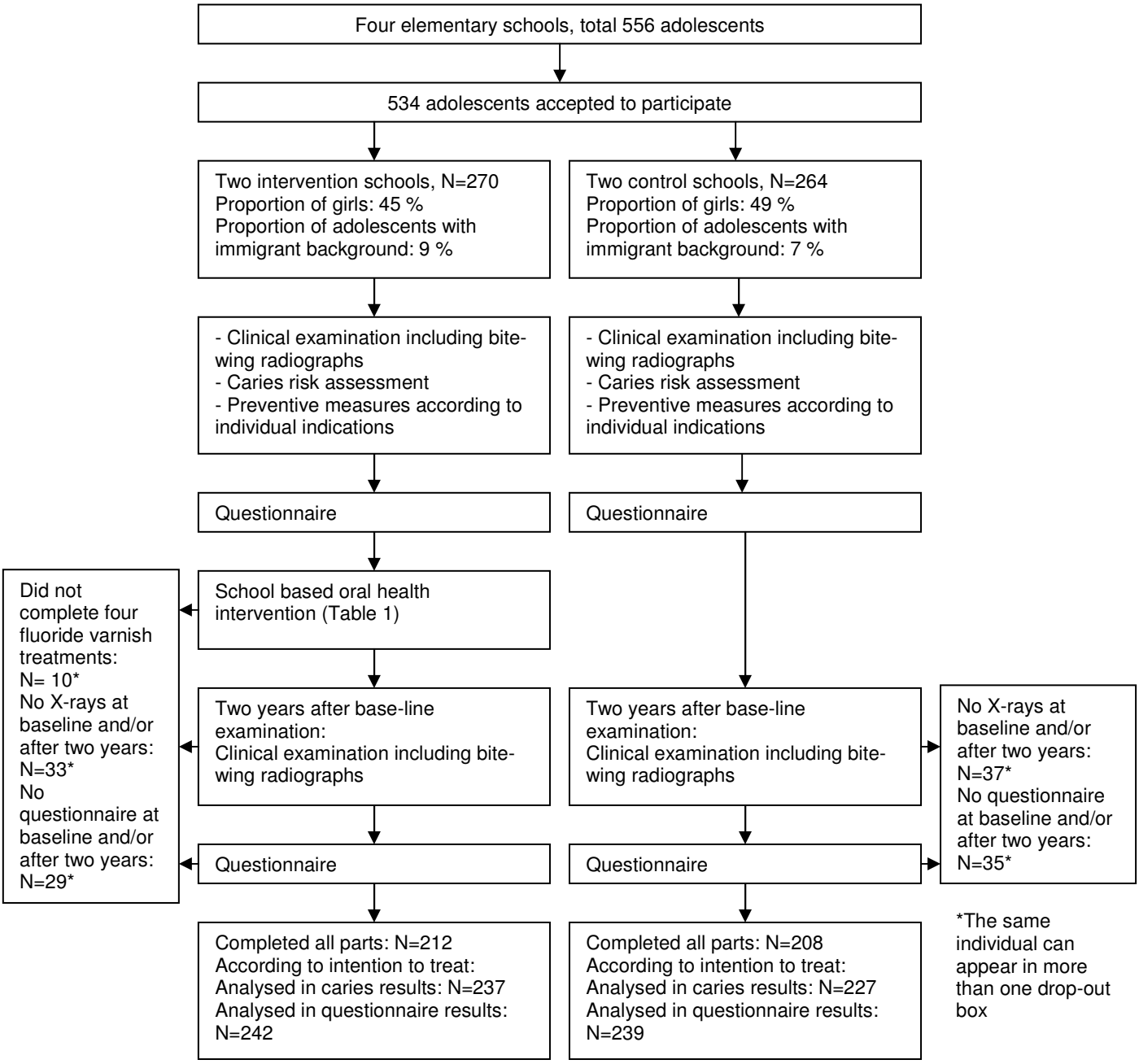

Fig 3. Flow chart of the study.

Subjects and procedures

A total of 556 adolescents from four different schools were invited and 534 agreed to participate. The project was introduced to the adolescents, parents and school staff in a letter and at meetings at school before the study started. The study was introduced in August 2009 in grades 6, 7 and 8 in the four schools, two intervention and two control schools. It ran for two years until the

students completed grades 7, 8 and 9 (June 2011).Two dental hygienists, one at each intervention school implemented the programme. Each dental hygienist was given her own room at school where she could work. The dental hygienists worked on education relating to oral health and tobacco, with an open dental hygienist clinic where the adolescents were offered preventive measures on an individual basis. The hygienists also supported school staff when it came to the products that are suitable to sell at the school cafeteria. The intervention consisted of recurring education on oral health and tobacco use. The education took place in conjunction with ordinary lessons like biology and chemistry, where the dental hygienists co-operated with the school teachers. The lecture aimed to stimulate communication between the participants and to increase the adolescents' self-confidence, and, through interaction with their classmates and school staff, help them to clarify their own attitudes and thoughts with regard to oral health and tobacco use (Steinberg, 1994; Flay, 2009; Hedman et al., 2010).

At the open clinic (four hours a week), dental health screenings and fluoride varnish treatments were performed every six months. Adolescents identified as at-risk for caries were offered preventive measures such as dietary advice, and oral hygiene instructions in accordance with the guidelines in the county (Fig. 2). Using dialogue, the dental hygienist attempted to motivate the adolescents to improve their oral health behaviour.

At the dental clinic, two or four bite-wing radiographs were taken at baseline and after the two-year trial. The radiographs were scored before and after the study using a high-resolution computer screen and were assessed by a dentist associated with the project.

Information about the adolescent's knowledge of and attitudes to oral health and tobacco use was obtained through questionnaires at the start of the study and at the end of the study in both the intervention and control schools. The questionnaire at the start (Appendix 2) consisted of 14 structured questions, referring to oral health, nutrition and tobacco use, and it was partly based on the questionnaire that was used in Paper I. The questionnaire at the end of the study consisted of 15 structured questions and also shed light on the adolescents' views of health promotion in school (Appendix 3).

Paper IV

Aim

The aim was to describe adolescents' experiences of participating in a school-based oral health programme for two years.

Study design

The study had a descriptive qualitative design based on focus group interviews with adolescents' from the school-based intervention study (Paper III). The interview related to the adolescents' experiences of participating in the school-based oral health programme. The interviews were analysed according to a phenomenographic approach (Lepp and Risberg, 2002; Sjöström and Dahlgren, 2002). It was important to become familiar with the content and to obtain an overall impression of the interviews from the very start. One of the authors (EH) studied, listed and read the text several times after the interviews had been transcribed verbatim. Similarities and differences in the material were noted. The next stage was a more specific reading aimed to detect the various experiences of the participants. During the reading, three themes and nine categories emerged, describing the variation in meaning within the different domains of the data. This constituted the outcome, defined as the adolescents' various experiences of the oral health intervention programme at school (Sjöström and Dahlgren, 2002). The credibility of the categories was discussed and redefined, both in a research group with several researchers familiar with the phenomenographic method and between the authors until agreement was reached.

Subjects and procedures

The interview study was conducted in the spring of 2011 and the participants consisted of 16 adolescents', ten girls and six boys between the ages of 13-16. The participants were chosen from a larger sample of 212 adolescents from the school-based intervention study (Paper III, Fig. 3). According to the phenomenographic approach the participants were selected to represent a variety of participants (Sjöström and Dahlgren, 2002). The participants fulfilled the inclusion criteria for the study, defined as: Swedish-speaking girls and boys, 13-16 years of age from three different grade levels (7,8,9) who had attended the whole oral health programme at school. Data were collected in three tape-recorded focus group interviews, with four to seven participants in each group. The method is based on group interaction and can be valuable for capturing how conceptions are constructed (Barbour, 1999). The interviews were performed in conversation and conducted by a dental hygienist (EH) trained in qualitative interviewing while an observer made

notes during each session to aid in the analysis of the transcriptions. Each session lasted 20-30 minutes and was tape- recorded to ensure transcription accuracy.

Statistical analyses

Statistical analyses were performed in Papers I and III, using quantitative methods. All the statistical analyses were conducted by statisticians from Uppsala Clinical Research, Uppsala University, Sweden.

In Paper I the distribution of the answers in the questionnaire was presented in frequency tables. Differences between gender, age and immigrant/native background were analysed using the Monte-Carlo simulation of Fisher's F-test. The test involved the ratio of the between-groups mean square and the within-groups mean square. As the expected value of certain cells was not sufficient for performing a Chi square test, which could have resulted in an incorrect p-value, Fisher's F-test was chosen. A level of 5% significance was used.

In Paper III a power calculation was made before the study started. A power analysis aims to decide, during the process of designing the study, how large a sample that is needed to enable statistical judgements that are correct and reliable. In Paper III power was calculated from two variables: the expected difference in attitude to oral health and future tobacco use and caries development. The expected differences in attitudes were based on the results of a study by Hedman et al. (2010). The expected caries development used a study by Moberg Sköld et al. (2005b) for power calculation. A sample size of 180 in each group was calculated to have 80% power to detect a difference in the DSa mean value of 0.15 (DSa = decayed approximal surfaces). A nonparametric test was going to be performed and approximately 200 school children in each group were therefore supposed to be included. All the data from both questionnaires and clinical examinations, were single key entered into a database (PheedIt). According to the intention-to-treat principles, analysis was based on all adolescents who were included in the study at baseline, which means that all randomized adolescents´ data was used for analysis regardless if they had participated in all interventions.

In Paper III, two hypotheses were tested. First, there is no association between the intervention and caries, and, second, there is no association between the intervention and knowledge of/attitude to oral health and tobacco. The response variables were dichotomized caries prevalence and dichotomised knowledge /attitude at the end of the study, respectively. The results

were shown as odds ratios and corresponding 95% confidence intervals (CI) together with the associated p-value. The interaction between time and group was tested by using “discordant pairs” for the control and intervention groups in a single table and calculating the Pearson chi-square and applying a clustered permutation test. The number of surfaces with an incidence and/or progression was calculated for each adolescent in order to evaluate differences in caries incidence and progression between the groups. The Mann Whitney U-test was calculated and a clustered permutation test was applied. Cohen’s kappa coefficient was used to analyse the intra-examiner reliability. All the statistical tests were performed at the 0.05 level of significance with two-sided tests.

Results

Paper I

The results revealed that an equal number of boys and girls answered the questionnaire and the level of the participants' knowledge was relatively high. The majority felt that their teeth were important. Most of the adolescents had learned about oral health from the dental team. All the questions showed a distribution of correct answers in favour of the girls, with one exception; the question about the meaning of the word "periodontitis", where the boys answered correctly to a greater extent. Older students had more knowledge than younger students as the younger students did not display more knowledge than the older ones in any of the questions. Their knowledge of the effect of toothpaste was comprehensive; 85% knew that fluoride strengthens the teeth. The results demonstrated that 88% of the participants knew how to eat to reduce the caries risk. Adolescents with an immigrant background showed less knowledge in several areas compared with natives of Sweden. Despite having less knowledge of oral health, more adolescents with an immigrant background than natives of Sweden stated that their teeth were important (Fig. 4).

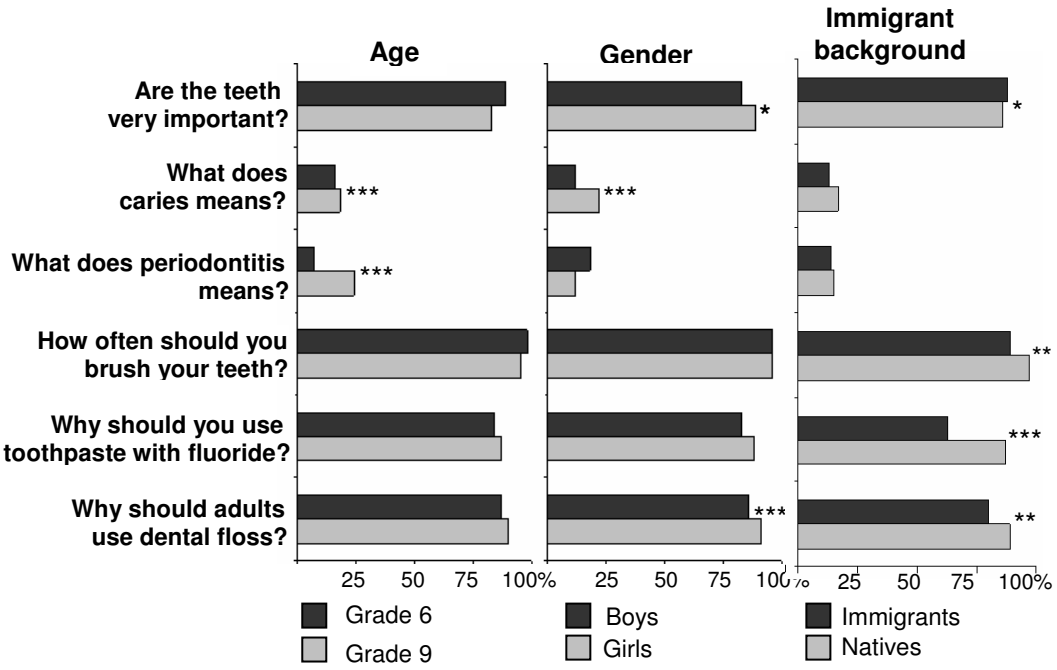

Fig 4.Percentage of individuals who chose the correct/best answers to certain questions in the questionnaire related to age, gender and immigrant background.
* Significant differences p<0.05
** Significant differences p<0.01
*** Significant differences p<0.001

Paper II

The results identified different perspectives within four content areas: aim of oral health promotion in school, content of the lessons, views of knowledge and learning and attitudes. According to the participants, oral health promotion in school was described as very important and they expressed a desire to work with health promotion. The aim of health promotion was to create an active, participating individual who is responsible for his/her own oral health and not only to provide biomedical facts. At the same time, there was a clear cut-view when it comes to the facts that should be included in the education; information about oral diseases, dietary habits and oral hygiene was stressed. The expression "oral health promotion" was frequently used and supported by all the interviewed informants, but the statements did not highlight the informants' definition of the concept.

Two different views of knowledge and learning could be seen in the statements. The dental staff partly passed on information according to traditional oral health programmes, based on information about biomedical facts, where the children were categorised by age and previous knowledge. On the other hand, the communication between dental staff and the children was described as essential, allowing the children the opportunity to communicate their thoughts, questions and experiences.

Statements about people's right to obtain knowledge were found and, at the same time, the dental professionals have both duties and rights to pass on knowledge, this was described as a mission. Children's and parents' own responsibility for healthy habits was stressed, but no reflection on ethical considerations associated with influencing people's daily living habits was found. The text revealed a discrepancy between the participants, and even within the same individual, showing ambivalence towards oral health education. Some individuals suggested lessons guided by communication with the children, while others wanted to maintain methods based on information about oral diseases to a greater extent (Table 4).

Table 4.Contradictory statements about health promotion expressed by the informants.

Interaction	One- way communication
Oral health	Absence of disease
Behavioural science	Biomedical science
Participants term	Guided lessons
Lessons guided by the participants	Strict oral health programme
Positive basic tone	Threaten, frighten
Own responsibility	Control, supervision
Change through own choice	Direct towards healthy behavior
Optimism	Scepticism

Paper III

A significantly smaller number of individuals who had enamel caries after the intervention were found in the intervention group, but no effect on dentin caries could be seen, all measured on the approximal tooth surfaces of molars and premolars. When the study started, slightly more adolescents in the intervention group compared with the control group were caries free, described as $D_{1+2+3}FSa = 0$ (74% and 72%, respectively), while the same percentage, 24 %, had enamel caries ($D_{1+2}Sa \geq 1$). After two years the number of caries free individuals had decreased in both groups, but more in the control group (5% and 9%, respectively). Two percent of the individuals in the intervention group had developed caries in the outer part of the enamel (D_1Sa) during the two years, while 13% in the control group showed the same change (Fig. 5).

As the study started, there were no differences in caries prevalence between the groups. After two years, although the intervention group had a tendency to lower incidence ($p=0.10$), no significant differences in the mean and median values for caries incidence or progression between the studied groups could be seen. The preventive fraction represents the percentage of cases that can be prevented after taking part in to the intervention. The preventive fraction was measured with the incidence of approximal caries as the threshold and was estimated to be 50% for the intervention programme compared with the control group,

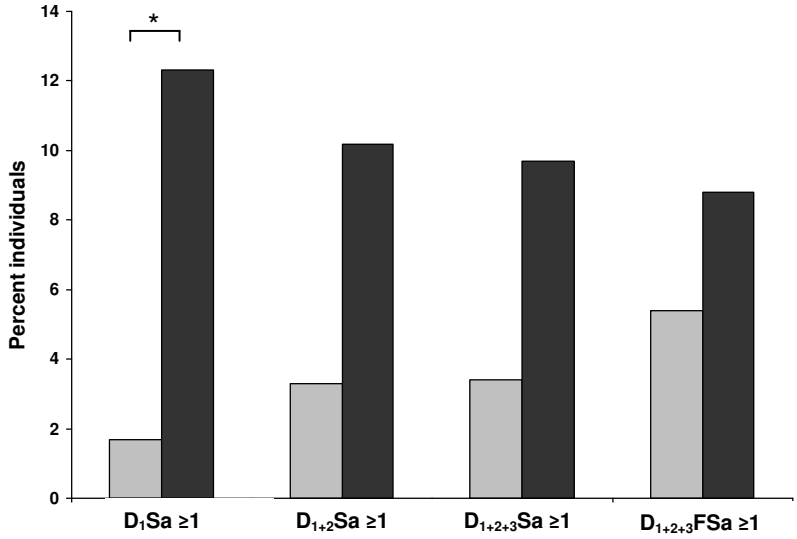

Fig 5. Percentage of individuals in the intervention and control groups with increased values on the caries index after two years.

Intervention Control
Pearson chi-square and clustered permuted test, * p=0.002

The adolescents in both groups expressed their teeth as important. In several questions concerning oral health and oral habits the intervention groups showed better knowledge than the control group after the intervention. The questions "What does caries mean?" and "How often should you brush your teeth?" showed statistically significant differences between the groups. (Fig.6). Half of the adolescents did not see themselves as tobacco users in the future. The majority of the adolescents were positive about the education in oral health and tobacco and they appreciated having a dental hygienist located at school.

In Papers I and III part of the same questionnaire was used and, in Fig. 6, some of the answers are compared between the studied populations. Some questions show a similar response pattern. In others, e.g. the meaning of the words "caries" and "periodontitis" and the reason for using fluoride toothpaste, the adolescents in the intervention group in Paper III showed better knowledge than others.

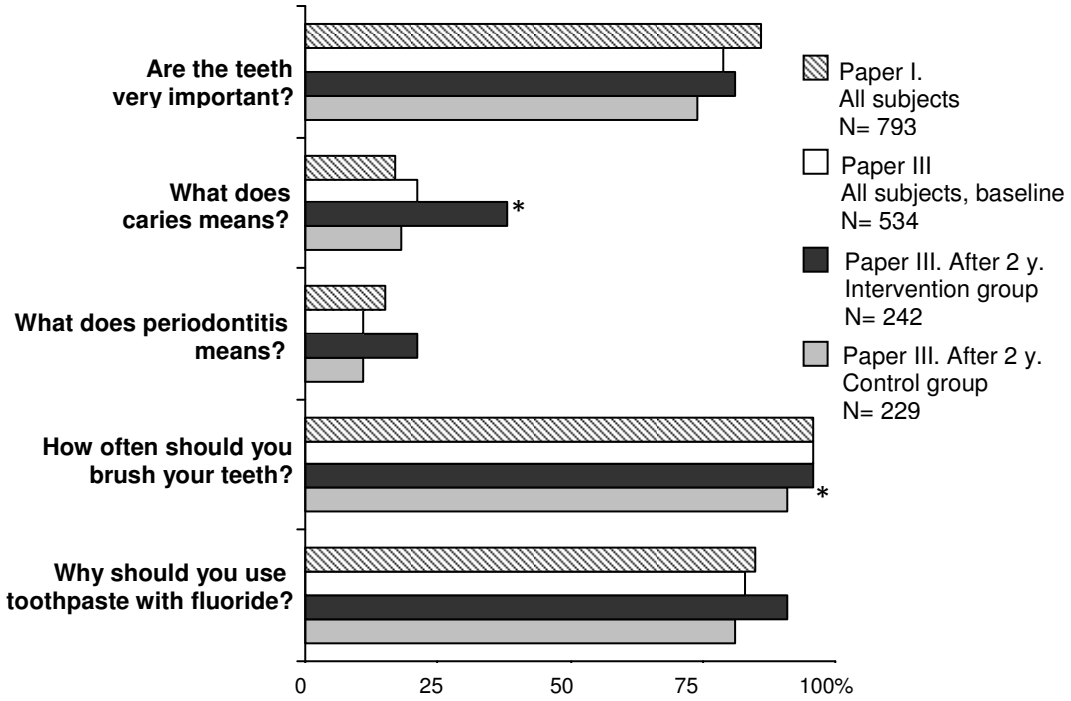

Fig 6. Proportion of individuals in Paper I and III who chose the correct/best answers to certain questions in the questionnaire.
* Significant differences: Intervention vs. control group after intervention (Paper III), $p<0.05$

Paper IV

In this focus group interview study the adolescents statements were presented as three themes and seven descriptive categories. Quotes were used to describe the adolescent's experiences of participating in a school-based oral health intervention programme.

Theme : "Seeing the dental hygienist"

This theme consisted of two categories: "Easy to access", and "Developing trust" and expressed statements about accessibility to the dental hygienist and the time savings. The time gained was described as not have to wait for the bus back and forth to the dental clinic. The short distance to the dental hygienist at school made it possible for the adolescents to participate in almost all their classes. Feelings of trust in the dental hygienist were expressed. The contact between the participants and the dental hygienist was important and the opportunity to ask questions about oral health issues was emphasised.

Theme: "Treatment at the dental hygiene clinic"

The second theme comprised three categories "Importance of the environment for feeling comfortable or uncomfortable", "Fluoride varnish a positive and negative event" and "Taste of the varnish was special". These categories described how differently the adolescents experienced the environment at the school dental hygienist clinic compared with the public dental clinic. The fluoride varnish treatment was given both positive and negative reviews. The taste and texture was described as special, some of the participants described it as strong and yucky and suggestions for new flavours of the varnish were made. Others described the fluoride varnish as quite nice and pleasant taste. Being treated in groups appeared to create a sense of security, but at the same time, the participants said it was difficult to say no if all classmates accept the offer to participate. The feeling of not fitting in or being accepted by peers appeared to be strong.

Theme : "Training about oral health in class".

According to the statements in the third theme interest in and responsibility for oral health issues had increased when education was provided regularly in class and in an active way during the school term. The interplay with classmates and others appeared to generate social support and made it possible to learn from one another. The categories were: "Learning and expanding knowledge" and "Taking control of your own health".

Discussion

Methodological considerations

Knowledge about people's attitudes to and understanding of various complex phenomena can be obtained in several ways. Depending on the theoretical foundation, aim and practical circumstances, some methods are more suitable than others. In this thesis, both quantitative and qualitative methods were used. In research, it is possible to use two different types of data to generate a third, this is known as triangulation or multiple methods. Using multiple methods, the research problem is studied in more than one way (Cohen and Manion, 1994; Dobratz, 2006). In this perspective, it is also possible to use both quantitative and qualitative methods. The use of multiple methods does not mean that the results must confirm one another; instead each method can contribute to another side of the problem. The strength of qualitative methods and analysis lies in their variation and not in theirs generalisation (Cohen and Manion, 1994). In this thesis, variations meant providing a more detailed picture of how the interviewees perceived oral health and health promotion in schools. Together with data collected through questions about knowledge of and attitudes to oral health and data about caries incidence, this thesis provided both variations and data that may allow generalisations.

The intervention (Paper III)

The oral health intervention programme was conducted at two intervention schools and two dental hygienists, one at each school, implemented the programme. Before the study started, the dental hygienists were calibrated with the aim of performing the parts of the intervention in a similar way. However, when it came to the education on oral health and tobacco, the main features were predefined, but it was important not to pre-arrange the teaching in detail as the emphasis was on communication and dialogue with the adolescents and allowing the adolescents' interest to determine the content of the lessons. According to Silva (2008), oral health professionals can stimulate the empowerment process, by providing adolescents with health information, encouraging changes in daily living habits and focusing on the adolescents' own capacity and resources. This may not be in line with an experimental design, but it is well in line with useful pedagogic methods where the learning process is stimulated (Eriksson and Lindström, 2008).

The questionnaire studies (Papers I and III)

Knowledge of and attitudes towards oral health and tobacco were tested with questionnaires in school. Several of the questions in both Papers I and III call for answers in the form of factual knowledge. Knowledge is therefore regarded as a quantitative measure of reproduction, where the adolescents are expected to reproduce something that they have already learned. Studies have shown that knowledge and facts are not enough to induce people to change their health behavior (Kay and Locker, 1998; Eriksson and Lindström, 2008; Tolvanen et al., 2009). Facts are clearly an important part of the message, but they must be complemented by reflection and consideration of how the receiver understands the knowledge and the realisation of the complexity of oral health promotion (Marton, 1994).

It is possible to ask whether the questions in Papers I and III are relevant when it comes to measuring attitudes and knowledge. Is it possible to relay on that the answers being true? The possibility that some adolescents respond in the way they perceive as socially acceptable cannot be excluded. Some may exaggerate or fantasies, while others may not believe that their anonymity is guaranteed. To achieve validity, the questions have been used in a pilot study. However, even if the questions have been tested it does not guarantee validity in these studies. Everyone in the class answered the questionnaires on the same occasion, and in the presence of a dental hygienist who gave instructions for the data collection. She also emphasised anonymity, which probably improved the opportunity to obtain truthful answers. The rate of participation was high in both papers, and this could be due to several factors. Great consideration has been given to the adolescents' age and the use of simple, clear questions of relevance to the purpose of study. The idea was to use structured questions with pre-choice alternatives to facilitate the completion of the questionnaire, which would in turn affect the number of individuals who responded.

The interview studies (Papers II and IV)

The aim of Paper II was to describe dental professionals' view of knowledge, learning and health promotion. The data were collected through interviews and analysed according to the discourse method. This method has been used in health care education, social and human sciences (Eglin and Hester, 2003). The analysis of discourse stresses the variation and distinctions in the statements and it is the statements that connect attitudes, knowledge, power and resistance (Potter and Wetherell, 1987).

Studying my own daily work has been both interesting and difficult, not least because of my deep pre-understanding of the area of health education in school. This can be both a weakness and strength of the analysis. As a dental hygienist, I have a relationship with the participants in the study, and therefore have access to important information that would otherwise be difficult to obtain. In this way, as ethnographers call it, an inside perspective was taken, but an attempt was also made to build an outside perspective to clarify how the participants talk about oral health education (Silverman, 2006).The selection of participants was voluntary and the participants had experience of working with the education of schoolchildren.

Analysing and interpreting texts in a sequence, similarities and differences clearly emerged. There is no safe way to conduct a discourse analysis and, in addition, it is important to be very open and take the text variations seriously. Cherryholms (1993) stated that the purpose of reading a text is to find all the possible meanings in a text rather than finding the actual meaning. The ability to look at a statement from its contextual dependence is crucial for an understanding of the statement. To avoid unessential or overly extensive elements in the discourse, the framing of the questions and their relationship to the interview text formed a structural instrument for analysis (Cherryholms,1993). The questions served as a kind of orientation aid in the interpretation work. Since discourse analyses do not make any divisions or limitations in advance, this can be a weakness and it also affected the analyses of the interviews in accordance with the principles of a discourse analysis.

Study IV aimed to study adolescents' experiences of taking part in a health promotion intervention at school. To gain access to the participants' experiences, a qualitative method based on the phenomenographic research approach was used. The fundamental assumption of this approach is that there is qualitative variation in the way people experience phenomena in the world around them. Here the phenomenon under study is the experiences of an oral health promotion program in school. The approach is empirical and focuses on describing the world as people see it, rather than on explanations, links or frequencies (Sjöström and Dahlgren, 2002).

The selection of participants was based on a large sample of 212 adolescents, who had participated in all parts of the school-based oral health intervention programme. A selection of individuals with different backgrounds and ages was made to obtain a variety of experiences (Sjöström and Dahlgren, 2002). Focus group interviews were chosen because the method initiates discussions and interaction within the groups. The interview began with a question: "Can you tell

me about your experiences of the school-based oral health intervention you participated in?" As a complement and to refresh the adolescents' memories, three photos from the intervention were used. This may have pushed the conversation in a certain direction, but it also helped to start the group discussions. The purpose of the interviews was not to establish a consensus among the participants, but to give everyone an opportunity to describe his or her experiences of the phenomenon (Brondani et al., 2008). Scientific work like this, that seeks an insight and an understanding of a phenomenon, raises many questions about the extent to which the researcher actually succeed in obtaining knowledge of the studied area. To which degree can the researcher obtain the informants' confidence and interpret what she sees and hears in an appropriate manner? These are important questions about scientific validity. In order to obtain the participants' own views, great importance has been attached to the situation of the interview. The interviewer has to listen actively to what is said, emphasis the plurality of views and not judge what are correct or inaccurate comments.

Quantitative research often seeks a large amount of data to show consistency. In Papers II and IV, inconsistency and variation were at least as interesting. Another purpose of the interviews was to provide a basis for the more forward-looking part of the dissertation, e.g. how oral health promotion should be planned in the future. Is the material large enough with 115 pages in Paper II and 53 pages in Paper IV? This is an empirical question that cannot be settled in a discussion of saturation. According to Potter and Wetherell (1987), it is not the number of statements that is interesting, but the study of variance in different accounts.

Knowledge of and attitudes to oral health among the adolescents (Papers I and III)

In Paper I, the level of knowledge among the adolescents was relatively high, especially when it came to questions about oral hygiene. The majority felt that their teeth were important, and the participants had heard about oral health from the dental team, but also from their parents. All the questions, except the question about "periodontitis", produced a distribution of correct answers in favour of the girls. Results in line with this have been presented in other studies. Östberg (2005) and Nilsson et al. (2006) reported that girls have a better knowledge of factors that influence health compared with boys. Girls also had more healthy habits, as shown by the use of fluorides and dental floss. Fifteen-year-old students displayed more knowledge compared with the younger students in all questions. Similar results have been reported by Östberg (2005). Adolescents with an immigrant background displayed less knowledge compared with natives of Sweden, and this has previously been found in a study by Källestål et al. (2000). In addition, more immigrants

chose consumption patterns of sweets that increase the risk of caries. Källestål et al. (2000) found that poor oral health behavior is related not only to immigrant background, but also to the part of the world from which the person or family emigrated. It cannot be excluded that a less strict definition of immigrant background in Paper I would have resulted in even larger differences between natives of Sweden and persons with an immigrant background.

In Paper III, the knowledge and attitudes were favourable from the start among the participants. Almost all of them said that their teeth were important and that tooth brushing should be performed twice a day, a finding in line with Paper I and a study by Jensen et al. (2012). However, the question was not whether the adolescents really brushed their teeth twice a day, but rather the recommended brushing frequency. Even if brushing should be performed twice a day, there is no guarantee that the brushing will be done and that toothpaste will be used properly. Only some participants could explain the words caries and periodontitis before the intervention, but after two years more individuals in the intervention group knew the answer. Moreover, knowledge of dietary habits was limited before the study started, but this improved in both groups during the study. One explanation for the improvement among participants might be that improved knowledge is attributable to the fact that children get older, as improving knowledge with increasing age is described in Paper I and in a study by Tolvanen et al. (2009). After two years, about half of the participants in both groups did not see themselves as future smokers/snuffers, something that is quite common and has also been found in other studies (Östberg, 2005; Nilsson et al., 2006).

Views of knowledge and learning among the dental professionals (Paper II)

Dental professionals stated that oral health promotion should focus on avoiding diseases and health was defined as the absence of the diseases of caries and periodontitis. Peoples understanding will increase and their behavior will change, mainly as a result of stimulation and motivation. The interview text stressed the individual's responsibility and participation as stated in the Swedish Dental Act (Ministry of Health and Social Affairs, 1985). According to the interviews, the biomedical view of knowledge dominated. As described in Paper I, the knowledge of oral health and diseases is high among teenagers in Uppsala County. The adolescents´ knowledge of dental caries exceeded their knowledge about periodontal conditions, a result in line with statements in Paper II, where the informants focused on dental caries during the lessons. Although several of the informants stressed that children nowadays are healthy, none of them suggested that their school lessons should terminated. This would have been a logical conclusion

since the effectiveness of dental education based on information is unclear (Kay and Locker, 1998; Backinger et al. 2003).

A discrepancy in opinions on knowledge and learning between the informants was found. There were even diverging opinions within the same individual, demonstrating ambivalence to oral health education. In some of the statements, a need to develop the educational dimension in oral health promotion was expressed. One interesting observation is that all of the dental hygienists suggested a dynamic process in line with the description by Chaiklin and Lave (1993), who claim that learning is closely related to an interaction between people and the world around them. However, in spite of the desire for new educational views, a traditional method was often used. One explanation could be that patterns of action can be so strong that, despite a conviction about the best educational method, the persons maintain existing, well-known methods (Henckel 1990).

Ethical issues associated with the education, such as personal integrity, control mentality, and use of persuasion and domination, were not raised by the informants. People have the right to receive knowledge and information, while society has an obligation to pass them on (Ministry of Health and Social Affairs, 1985). Paper II showed that dental professionals have a desire to work with health promotion. It also shows that the desire varies between individuals, and that some people reflection the importance of communication, while others want to adhere to more traditional methods based on one-way communication.

Effects on adolescents' caries incidence (Paper III)

The oral health intervention programme in Paper III resulted in a significantly smaller number of individuals who showed enamel caries, but no effect on dentine caries was observed. The result is not as clear as in previous studies by Moberg Sköld et al. (2005b) and two systematic reviews (Marinho et al., 2002; Petersson et al., 2004), which have shown a caries reduction of 30-70% in fluoride varnish programmes. Also in this study the caries reduction was at the same level, shown as preventive fraction of 50%, but since the caries incidence was not statistically significant, the results must be interpreted with caution. The effect on the enamel, but not on dentine caries, corresponds well with previous observations reporting that enamel lesions accounted for more than 90% of the caries reduction. One explanation for the somewhat lower reduction in our study might be that the intervention period was only 24 months compared with 36 months in the study by Moberg Sköld et al. (2005b). The progression of caries today is fairly slow, and a study

period of three years instead of two years may therefore even have led to a reduction in dentine caries. It must also be remembered that the sample size in Study III was fairly small.

Adolescents' experience of the school based intervention programme

The results from Paper IV reported both positive and negative experiences of the intervention programme. Personal contact between the participants and the dental hygienist appeared to be essential and was described as positive when it took place at school, in a neutral and less stressful environment. The participants emphasised the importance of being well informed and being given the opportunity to ask questions about their own teeth. This is in line with other studies, showing that the close contact between patient and therapist is important and has an impact on the outcome of dental treatment (Narby et al., 2011). According to the focus group discussions, the intervention generated social support, and this has previously been considered to be an essential element for health promotion (Noblet, 2003). The participants stated that the programme had given them a feeling of control over their own oral health.

The fluoride varnish treatment was experienced differently by the participants and the special taste and texture of the varnish was the topic of lively discussion. This is in line with a recently published study by Bergström et al. (2012) showing that the adolescents experienced the varnish differently from person to person. In the present study the varnish treatment was performed in groups and the group treatment appeared to create a feeling of security, as well as a sense of vulnerability. The participants discussed the difficulty of saying no if all their classmates agreed to participate in the fluoride treatment sessions. The feeling of not fitting in or not being accepted by peers appeared to be a strong motivational factor. Others found it a positive experience, as the group provided a feeling of security. Adolescence is a transitional period of life and can be described as an ongoing socialisation process, including learning and internalising values (Jackson et al., 1998). This is important when planning for health intervention programmes in the future. According to the statements, the participants emphasised the importance of good interaction between teachers and dental hygienists and the way this can stimulate further discussion among peers and parents. Since adolescents pass on information to the family, it is important to involve parents in oral health issues (Jackson et al., 1998). Good cooperation between players at school is also an important factor for students' and teachers' welfare and interaction (Jackson et al., 1998; Saaranen et al., 2007; Eriksson and Lindström, 2008). The participants in Paper IV reflected on activities in the classroom and the importance of a respect-filled meeting with the dental hygienist. This is in line with other findings, in which adolescents

expressed a desire to receive information in respect-filled dialogue and with a content dealing with health consequences that affect them and are not too distant in time (Östberg, 2005; Hedman et al., 2010).

Conclusions

This series of studies show that the school can act as an arena for oral health promotion and can also provide an opportunity to inform and encourage lifestyle changes and focus on the adolescents own capacity and resources. When adolescents meet a dental hygienist at school, it is easier to leave the role of patient and listen to and digest the health message as an autonomous human being. This agrees well with the theoretical framework of salutogenesis, which focuses on peoples' resources and capacity to promote health instead of understanding the nature of diseases and its associated risk-behaviours (Antonovsky, 1996; Lindström and Eriksson, 2005; Silva et al., 2008). The conclusions from these four studies are:

- adolescents showed a good knowledge of oral hygiene, but less when terms relating to oral diseases needed to be explained (Papers I and III),

- girls had more knowledge than boys, 15- year-olds more than 12-year-olds and natives of Sweden had more knowledge than those with an immigrant background in relation to most questions (Paper I),

- a large majority of adolescents said that their teeth were important (Papers I and III),

- dental hygienists and nurses expressed a desire to work with health promotion, although their approach differed; some required interaction with children and adolescents, while others preferred more traditional methods based on one-way communication (Paper II),

- the two-year, school-based oral health programme resulted in fewer individuals who showed enamel caries compared with the control group, but no differences in dentine caries could be found (Paper III),

- the adolescents expressed that the two-year oral health programme had given them a feeling of control over their own oral health (Paper IV), and

- the fluoride varnish treatment performed in groups was experienced differently by the adolescents; for some, the group treatment appeared to create a feeling of security, while others expressed a sense of vulnerability (Paper IV).

The main conclusion is therefore that the school can act as an arena for oral health promotion. Health promotion can provide opportunities to inform people about health and encourage changes in habits of daily living and focus on the adolescents' own capacity and resources.

Thoughts about the future

This thesis has highlighted the need for more knowledge about health promotion in practice, and the importance of pedagogic activities as tools for promoting oral health. The concept of oral health promotion is complex and there is a need for more studies from different perspectives using different methods. As some of the dental staff who were engaged in health promotion at school said that they still adhere to traditional teaching involving one-way communication, there is room to improve the pedagogic methods. Another research question is how the interaction between adolescents and the dental hygienist can be developed. Adolescents views of good teaching are clear and must be taken seriously and the importance of social interaction should not be underestimated. Little is known about how teachers, school nurses and other school staff experience the oral health programme at school. Furthermore, there is also a need for further studies from a health-economy perspective.

Acknowledgements

I would like to thank all of you who have inspired and supported me to perform this thesis. In particular I would like to thank:

Associate Professor Pia Gabre, my main supervisor and co-author for professional guidance and support and for always showing an interest in my work. Thank you for being there whenever I needed you, and for given me constructive criticism and interesting discussions in the world of research.

Professor Dowen Birkhed my supervisor and co-author for your inspiring, stimulating and enthusiastic support, especially when things were going against me and it felt troublesome.

Professor Margreth Lepp my co-author for your knowledge and good advice regarding qualitative research.

In addition, I would like to thank:

Lisa Wernroth for statistical analyses

Carina Landh and Marie Lindèn for skillful implementation of the oral health programme in school

Ulla Thörnblom for evaluating the radiographs

Helen Lindroth for practical support and taking notes at the focus group interviews

Linda Schenck, Gunilla Ramell and Jeanette Kliger, for revision of the English text

Colleagues and friends at the department of Dental Health Care Administration in Uppsala County Council.

Members of the FoU- council for financial support during this project

Finally I would like to thank my husband Göran and my children Gustaf and Charlotta with families for their support and patience with a sometime “absent” wife, mother and grandmother.

.

References

Ajzen, I. 2011. The theory of planned behaviour: reactions and reflections. *Psychol Health,* 26**,** 1113-27.

Ajzen, I. & Fishbein, M. 1980. *Understanding attitudes and predicting social behavior,* Englewood Cliffs, N.J., Prentice-Hall.

Alm, A. 2008. On dental caries and caries-related factors in children and teenagers. *Swed Dent J Suppl***,** 7-63, 1p preceding table of contents.

Antonovsky, A. 1996. The salutogenic model as a theory to guide health promotion. *Health Promotion International,* 11**,** 11-18.

Antonovsky, A., Cederblad, M., Elfstadius, M. & Lundh, L.-G. 1991. *Hälsans mysterium, [in Swedish],* Stockholm, Natur och kultur.

Backinger, C. L., Fagan, P., Matthews, E. & Grana, R. 2003. Adolescent and young adult tobacco prevention and cessation: current status and future directions. *Tob Control,* 12 Suppl 4**,** IV46-53.

Bandura, A. 1986. *Social foundations of thought and action : a social cognitive theory,* Englewood Cliffs, N.J., Prentice-Hall.

Barbour, R. S. 1999. The use of focus groups to define patient needs. *J Pediatr Gastroenterol Nutr,* 28**,** S19-22.

Bawden, J. W. 1998. Fluoride varnish: a useful new tool for public health dentistry. *J Public Health Dent,* 58**,** 266-9.

Beighton, D., Adamson, A. & Rugg-Gunn, A. 1996. Associations between dietary intake, dental caries experience and salivary bacterial levels in 12-year-old English schoolchildren. *Arch Oral Biol,* 41**,** 271-80.

Berg, G. V. & Sarvimaki, A. 2003. A holistic-existential approach to health promotion. *Scand J Caring Sci,* 17**,** 384-91.

Bergström, E. K., Moberg-Sköld U, Birkhed D, Lepp M. 2012. Adolescents' experiences of participating in school-based fluoride varnish programme in Sweden. *Swed Dent J,* 36,133-144.

Bergström, J. 2005. Smoking may impede gingival bleeding. *J Evid Based Dent Pract,* 5**,** 29-30.

Bratthall, D., Hansel-Petersson, G. & Sundberg, H. 1996. Reasons for the caries decline: what do the experts believe? *Eur J Oral Sci,* 104**,** 416-22; discussion 423-5, 430-2.

Brondani, M. A., MacEntee, M. I., Bryant, S. R. & O'Neill, B. 2008. Using written vignettes in focus groups among older adults to discuss oral health as a sensitive topic. *Qual Health Res,* 18**,** 1145-53.

Cherryholms C.1993. Reading reseach. *J Curriculum Stud*, 25:1-32.

Chaiklin, S. & Lave, J. 1993. *Understanding practice : perspectives on activity and context, p 3-32,* Cambridge, Cambridge Univ. Press.

Cohen K, & Mainiion L. 1994. *Research Methods in Education 4th edition*, 1 st edition 19980, London and New York:Rutledge.

Coleman, T., Kralikova, E. & Himmerova, V. 2004. [ABC of smoking cessation. Use of simple advice and behavioural support]. *Cas Lek Cesk,* 143**,** 713-5.

Crane-Ross, D., Lutz, W. J. & Roth, D. 2006. Consumer and case manager perspectives of service empowerment: relationship to mental health recovery. *J Behav Health Serv Res,* 33**,** 142-55.

Dobratz, M. C. 2006. Enriching the portrait: methodological triangulation of life-closing theory. *Advances in Nursing Science,* 29**,** 260-270.

Downie, R. S., Tannahill, C. & Tannahill, A. 1996. *Health promotion : models and values, p 59,* Oxford, Oxford Univ. Press.

Eglin, P. & Hester, S. 2003. *The Montreal Massacre, A Story of Membership Categoization Analysis,* Ontario, Wilfrid, Laurier University press.

Eriksson, M. & Lindström, B. 2008. A salutogenic interpretation of the Ottawa Charter. *Health Promot Int,* 23**,** 190-9.

Fairclough, N. 1989. *Language and power,* London, Longman.

Fairclough, N. 1992. *Discourse and social change,* Cambridge, Polity.

Featherstone, J. D. 2000. The science and practice of caries prevention. *J Am Dent Assoc,* 131**,** 887-99.

Featherstone, J. D. 2004. The caries balance: the basis for caries management by risk assessment. *Oral Health Prev Dent,* 2 Suppl 1**,** 259-64.

Flay, B. R. 2009. School-based smoking prevention programs with the promise of long-term effects. *Tob Induc Dis,* 5**,** 6.

Freeman, R. 1999. The psychology of dental patient care. 10. Strategies for motivating the non-compliant patient. *Br Dent J,* 187**,** 307-12.

Furnee, C. A., Groot, W. & van den Brink, H. M. 2008. The health effects of education: a meta-analysis. *Eur J Public Health,* 18**,** 417-21.

Galanti, M. R., Wickholm, S. & Gilljam, H. 2001. Between harm and dangers. Oral snuff use, cigarette smoking and problem behaviours in a survey of Swedish male adolescents. *Eur J Public Health,* 11**,** 340-5.

Glanz, K., Rimer, B. K. & Viswanath, K. 2008. *Health behavior and health education : theory, research and practice,* San Francisco, Jossey-Bass.

Greene, G. W., Rossi, S. R., Rossi, J. S., Velicer, W. F., Fava, J. L. & Prochaska, J. O. 1999. Dietary applications of the stages of change model. *J Am Diet Assoc,* 99**,** 673-8.

Hedman, E. 1998. *Basprofylaktisk tandhälsoinformation i grundskolan. [in Swedish],* Examensarbete 10 p. Lärarhögskolan i Stockholm.

Hedman, E., Riis, U. & Gabre, P. 2010. The impact of behavioural interventions on young people's attitudes toward tobacco use. *Oral Health Prev Dent,* 8**,** 23-32.

Henckel B. Förskollärare I tanke och handling [in Swedish],. Thesis, Umeå, Umeå Universitet, 1990.

Huber, M., Knottnerus, J. A., Green, L., van der Horst, H., Jadad, A. R., Kromhout, D., Leonard, B., Lorig, K., Loureiro, M. I., van der Meer, J. W., Schnabel, P., Smith, R., van Weel, C. & Smid, H. 2011. How should we define health? *BMJ,* 343**,** d4163.

Hugoson, A., Hellqvist, L., Rolandsson, M. & Birkhed, D. 2012. Dental caries in relation to smoking and the use of Swedish snus: epidemiological studies covering 20 years (1983-2003). *Acta Odontol Scand,* 70**,** 289-96.

Hwang, M. S., Yeagley, K. L. & Petosa, R. 2004. A meta-analysis of adolescent psychosocial smoking prevention programs published between 1978 and 1997 in the United States. *Health Educ Behav,* 31**,** 702-19.

Hänsel Petersson, G., Ericson, E., Isberg, P. E. & Twetman, S. 2012. Caries risk assessment in young adults using Public Dental Service guidelines and the Cariogram-a comparative study. *Acta Odontol Scand*. Jul 2. [Epub ahead of print]

Jackson, C., Henriksen, L. & Foshee, V. A. 1998. The Authoritative Parenting Index: predicting health risk behaviors among children and adolescents. *Health Educ Behav,* 25**,** 319-37.

Jadad, A. R. & O'Grady, L. 2008. How should health be defined? *BMJ,* 337**,** a2900.

Jensen, O., Gabre, P., Skold, U. M. & Birkhed, D. 2012. Is the use of fluoride toothpaste optimal? Knowledge, attitudes and behaviour concerning fluoride toothpaste and toothbrushing in different age groups in Sweden. *Community Dent Oral Epidemiol,* 40**,** 175-84.

Johansson, G. & Birkhed, D. 1994. Effect of a long-term change from a mixed to a lactovegetarian diet on human saliva. *Arch Oral Biol,* 39**,** 283-8.

Julihn, A., Barr Agholme, M., Grindefjord, M. & Modeer, T. 2006. Risk factors and risk indicators associated with high caries experience in Swedish 19-year-olds. *Acta Odontol Scand,* 64**,** 267-73.

Juul, A., Teilmann, G., Scheike, T., Hertel, N. T., Holm, K., Laursen, E. M., Main, K. M. & Skakkebaek, N. E. 2006. Pubertal development in Danish children: comparison of recent European and US data. *Int J Androl,* 29**,** 247-55; discussion 286-90.

Jönsson, B., Baker, S. R., Lindberg, P., Oscarson, N. & Öhrn, K. 2012. Factors influencing oral hygiene behaviour and gingival outcomes 3 and 12 months after initial periodontal treatment: an exploratory test of an extended Theory of Reasoned Action. *J Clin Periodontol,* 39**,** 138-44.

Kallestal, C., Flinck, A., Allebeck, P., Holm, A. K. & Wall, S. 2000. Evaluation of caries preventive measures. *Swed Dent J,* 24**,** 1-11.

Kannel, W. B., Dawber, T. R., Kagan, A., Revotskie, N. & Stokes, J., 3rd 1961. Factors of risk in the development of coronary heart disease--six year follow-up experience. The Framingham Study. *Ann Intern Med,* 55**,** 33-50.

Kaye, P.H, Fitzgerald R.J. 1962. Dental caries in the Syrian hamster-IX. *Archives of Oral Biology*,7,267-77.

Kay, E. & Locker, D. 1998. A systematic review of the effectiveness of health promotion aimed at improving oral health. *Community Dent Health,* 15**,** 132-44.

Kelder, S. H., Perry, C. L., Klepp, K. I. & Lytle, L. L. 1994. Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. *Am J Public Health,* 84**,** 1121-6.

Kleinman, D. V., Swango, P. A. & Pindborg, J. J. 1994. Epidemiology of oral mucosal lesions in United States schoolchildren: 1986-87. *Community Dent Oral Epidemiol,* 22**,** 243-53.

Kuusela, S., Honkala, E., Rimpela, A., Karvonen, S. & Rimpela, M. 1997. Trends in toothbrushing frequency among Finnish adolescents between 1977 and 1995. *Community Dent Health,* 14**,** 84-8.

Lagerberg, D. & Sundelin, C. 2000. *Prevention och intervention. Risk och prognos i socialt arbete med barn,* Gothia AB, Stockholm,

Lepp M & Risberg KC (eds.) 2002. *Phenomenography- a qualitative research approch*: Studentlitteratur.

Lerner, D. J., Levine, S., Malspeis, S. & D'Agostino, R. B. 1994. Job strain and health-related quality of life in a national sample. *Am J Public Health,* 84**,** 1580-5.

Lindström, B. & Eriksson, M. 2005. Salutogenesis. *J Epidemiol Community Health,* 59**,** 440-2.

Lingström, P., Holm, A. K., Mejàre, I., Twetman, S., Söder, B., Norlund, A., Axelsson, S., Lagerlöf, F., Nordenram, G., Petersson, L. G., Dahlgren, H. & Källestal, C. 2003. Dietary factors in the prevention of dental caries: a systematic review. *Acta Odontol Scand,* 61**,** 331-40.

Marinho, V. C. 2009. Cochrane reviews of randomized trials of fluoride therapies for preventing dental caries. *Eur Arch Paediatr Dent,* 10**,** 183-91.

Marinho, V. C., Higgins, J. P., Logan, S. & Sheiham, A. 2002. Fluoride varnishes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev***,** CD002279.

Marinho, V. C., Higgins, J. P., Logan, S. & Sheiham, A. 2003a. Fluoride mouthrinses for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev***,** CD002284.

Marinho, V. C., Higgins, J. P., Sheiham, A. & Logan, S. 2003b. Fluoride toothpastes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev*, CD002278.

Marton F, Dahlgren L-O,Svensson L, Säljö R.1994. Inlärning och omvärlsuppfattning. Uppl 9. [in Swedish]*,* Almqvist & Wiksell Förlag AB, Stockholm.

Mejáre, I., Källest l, C. & Stenlund, H. 1999. Incidence and progression of approximal caries from 11 to 22 years of age in Sweden: A prospective radiographic study. *Caries Res,* 33**,** 93-100.

Merne, M., Heinaro, I., Lahteenoja, H. & Syrjanen, S. 2002. Proliferation and differentiation markers in snuff-induced oral mucosal lesions. *J Oral Pathol Med,* 31**,** 259-66.

Ministry of Health and Social Affairs 2002. *Folkhälsoprop.2002/03:35 [in Swedish],* Stockholm, Sweden.

Ministry of Health and Social Affairs. 1985. *Dental Act [in Swedish],* Stockholm, Fritzes.

Ministry of Health and Social Affairs. 1982. *Hälso och sjukvårdslagen [in Swedish],* Stockholm, Fritzes

Moberg Sköld, U., Birkhed, D., Borg, E. & Petersson, L. G. 2005a. Approximal caries development in adolescents with low to moderate caries risk after different 3-year school-based supervised fluoride mouth rinsing programmes. *Caries Res,* 39**,** 529-35.

Moberg Sköld, U., Petersson, L. G., Lith, A. & Birkhed, D. 2005b. Effect of school-based fluoride varnish programmes on approximal caries in adolescents from different caries risk areas. *Caries Res,* 39**,** 273-9.

Naidoo, J. & Wills, J. 2000. *Health promotion : foundations for practice, p 82,* New York ;, Bailliere.

Narby, B., Bagewitz, I. C. & Söderfeldt, B. 2011. Factors explaining desire for dental implant therapy: analysis of the results from a longitudinal study. *Int J Prosthodont,* 24**,** 437-44.

National Board of Health and Welfare 2009. *Hälso och sjukvårdsrapport [in Swedish],* Stockholm, Sweden.

National Food Agency 2003. *Riksmaten-barn 2003, Livsmedel och näringsintag bland barn i Sverige [in Swedish],* Östervåla, Sweden, Elanders Tofters AB.

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

Nishi, M., Stjernsward, J., Carlsson, P. & Bratthall, D. 2002. Caries experience of some countries and areas expressed by the Significant Caries Index. *Community Dent Oral Epidemiol,* 30**,** 296-301.

Noblet, A. 2003. Building health promoting work settings: identifying the relationship between work characteristics and occupational stress in Australia. *Health Promot Int,* 18**,** 351-9.

Nordenfelt, L. 1991. *Livskvalitet och hälsa : teori & kritik,* Solna, Almqvist & Wiksell.

Nordström, A. & Birkhed, D. 2010. Preventive effect of high-fluoride dentifrice (5,000 ppm) in caries-active adolescents: a 2-year clinical trial. *Caries Res,* 44**,** 323-31.

O'Dea, J. A. & Abraham, S. 2000. Improving the body image, eating attitudes, and behaviors of young male and female adolescents: a new educational approach that focuses on self-esteem. *Int J Eat Disord,* 28, 43-57.

Paes Leme, A. F., Koo, H., Bellato, C. M., Bedi, G. & Cury, J. A. 2006. The role of sucrose in cariogenic dental biofilm formation--new insight. *J Dent Res,* 85**,** 878-87.

Petersson, L. G. 1993. Fluoride mouthrinses and fluoride varnishes. *Caries Res,* 27 Suppl 1**,** 35-42.

Petersson, L. G., Twetman, S., Dahlgren, H., Norlund, A., Holm, A. K., Nordenram, G., Lagerlöf, F., Söder, B., Källestål, C., Mejare, I., Axelsson, S. & Lingström, P. 2004. Professional fluoride varnish treatment for caries control: a systematic review of clinical trials. *Acta Odontol Scand,* 62**,** 170-6.

Potter, J. & Wetherell, M. 1987. *Discourse and social psychology : beyond attitudes and behaviour, p 160-65,* London, Sage.

Rose, G. 2001. Sick individuals and sick populations. 1985. *Bull World Health Organ,* 79**,** 990-6.

Rosendahl, K. I., Galanti, M. R., Gilljam, H. & Ahlbom, A. 2005. Knowledge about tobacco and subsequent use of cigarettes and smokeless tobacco among Swedish adolescents. *J Adolesc Health,* 37**,** 224-8.

Rosseel, J. P., Hilberink, S. R., Jacobs, J. E., Maassen, I. M., Plasschaert, A. J. & Grol, R. P. 2010. Are oral health complaints related to smoking cessation intentions? *Community Dent Oral Epidemiol,* 38**,** 470-8.

Saaranen, T., Tossavainen, K., Turunen, H., Kiviniemi, V. & Vertio, H. 2007. Occupational well-being of school staff members: a structural equation model. *Health Educ Res,* 22**,** 248-60.

Sakki, T. K., Knuuttila, M. L., Vimpari, S. S. & Hartikainen, M. S. 1995. Association of lifestyle with periodontal health. *Community Dent Oral Epidemiol,* 23**,** 155-8.

Sellström, E. & Bremberg, S. 2006. Is there a "school effect" on pupil outcomes? A review of multilevel studies. *J Epidemiol Community Health,* 60**,** 149-55.

Selwitz, R. H., Ismail, A. I. & Pitts, N. B. 2007. Dental caries. *Lancet,* 369**,** 51-9.

Silva, A. N., Mendonca, M. H. & Vettore, M. V. 2008. A salutogenic approach to oral health promotion. *Cad Saude Publica,* 24 Suppl 4**,** s521-30.

Silverman, D. 2006. *Interpreting qualitative data : methods for analyzing talk, text and interaction,* London, SAGE.

Silverman, H. J. 1980. *Piaget, philosophy and the human sciences.* Harvester studies in cognitive science. Atlantic Highlands, Humanities P.

Sjöström, B. & Dahlgren, L. O. 2002. Applying phenomenography in nursing research. *J Adv Nurs,* 40**,** 339-45.

Skeie, M. S., Espelid, I., Skaare, A. B. & Gimmestad, A. 2005. Caries patterns in an urban preschool population in Norway. *Eur J Paediatr Dent,* 6**,** 16-22.

Smith, E. P. 2007. The role of afterschool settings in positive youth development. *J Adolesc Health,* 41**,** 219-20.

Steinberg, J. M. 1994. Aktiva värderingar för 2000-talet. Solna: Ekelund.

St Leger, L. & Nutbeam, D. 2000. A model for mapping linkages between health and education agencies to improve school health. *J Sch Health,* 70**,** 45-50.

Strandmark, M. 2007. The concept of health and health promotion. *Scand J Caring Sci,* 21**,** 1-2.

Sundin, B. & Granath, L. 1992. Sweets and other sugary products tend to be the primary etiologic factors in dental caries. *Scand J Dent Res,* 100**,** 137-9.

The National Board of Health and Welfare 2011. *National Guidelines for Adult Dental Care [in Swedish],* Stockholm, The National Board of Health and Welfare.

The Swedish Council on Technology Assesment in Health Care. *Att förebygga karies. [in Swedish],* SBU report No 161, 2002.

Thomas, R. & Perera, R. 2006. School-based programmes for preventing smoking. *Cochrane Database Syst Rev***,** CD001293.

Tolvanen, M., Lahti, S., Poutanen, R., Seppa, L., Pohjola, V. & Hausen, H. 2009. Changes in children's oral health-related behavior, knowledge and attitudes during a 3.4-yr randomized clinical trial and oral health-promotion program. *Eur J Oral Sci,* 117**,** 390-7.

Tomar, S. L. & Asma, S. 2000. Smoking-attributable periodontitis in the United States: findings from NHANES III. National Health and Nutrition Examination Survey. *J Periodontol,* 71**,** 743-51.

Tones, K. & Green, J. 2004. *Health promotion : planning and strategies,* London, SAGE.

Tones, K. & Tilford, S. 2001. *Health promotion : effectiveness, efficiency and equity,* Cheltenham, Nelson Thornes Ltd.

Uppsala County Council, 2011. *Life and Health Young [in Swedish],* Uppsala, Sweden, Uppsala County Council.

Uppsala County Council, 2012. *Vårdavtal mellan Folktandvården och Hälso och sjukvårdsstyrelsen [in Swedish],* Uppsala, Uppsala County Council.

Walsh, T., Worthington, H. V., Glenny, A. M., Appelbe, P., Marinho, V. C. & Shi, X. 2010. Fluoride toothpastes of different concentrations for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev***,** CD007868.

Watt, R. G. 2007. From victim blaming to upstream action: tackling the social determinants of oral health inequalities. *Community Dent Oral Epidemiol,* 35**,** 1-11.

Welfare, R. & Scully Cbe, C. 2006. Eastman excitement. *Br Dent J,* 201**,** 250-1.

Vellappally, S., Fiala, Z., Smejkalova, J., Jacob, V. & Shriharsha, P. 2007. Influence of tobacco use in dental caries development. *Cent Eur J Public Health,* 15**,** 116-21.

Wennhall, I., Matsson, L., Schroder, U. & Twetman, S. 2002. Caries prevalence in 3-year-old children living in a low socio-economic multicultural urban area in southern Sweden. *Swed Dent J,* 26**,** 167-72.

Vetter, N. C., Leipold, K., Kliegel, M., Phillips, L. H. & Altgassen, M. 2012. Ongoing development of social cognition in adolescence. *Child Neuropsychol*. Aug 31. [Epub ahead of print]

WHO, 1986. *Ottawa charter for Health Promotion*. Canadian Public Health Association, Ontario.

WHO, 2003. *The World Oral Health Report, shaping the future*. Geneva.

WHO, 2007. *The World Oral Health Report, A safer future: global public health, security in the 21 st century*. Geneva.

WHO, 1947. *The constitution of the World, sCron.,*Geneva 1:27.

Ylostalo, P., Sakki, T., Laitinen, J., Jarvelin, M. R. & Knuuttila, M. 2004. The relation of tobacco smoking to tooth loss among young adults. *Eur J Oral Sci,* 112**,** 121-6.

Östberg, A. L. 2005. Adolescents' views of oral health education. A qualitative study. *Acta Odontol Scand,* 63**,** 300-7.