

Oral Health in Swedish Women

Impact of social and psychological
factors over time

Anette Wennström

Department of Behavioral and Community Dentistry
Institute of Odontology
Sahlgrenska Academy at University of Gothenburg



UNIVERSITY OF GOTHENBURG

Gothenburg 2015

Cover illustration: “Happy Middle-Aged Women” by Anette Wennström,
photographer Magnus Hakeberg.

Oral Health in Swedish Women
© Anette Wennström 2015
anette.wennstrom@odontologi.gu.se

ISBN 978-91-628-9600-3 (printed)
ISBN 978-91-628-9599-0 (e-pub)
<http://hdl.handle.net/2077/39558>

Printed in Gothenburg, Sweden 2015
Ale Tryckteam AB



To
My Beloved Parents
&
My Family
Lukas, Jonathan, Linnéa
&
Robert.

Oral Health in Swedish Women

Impact of social and psychological factors over time

Anette Wennström

Department of Behavioral and Community Dentistry, Institute of Odontology
Sahlgrenska Academy at University of Gothenburg, Sweden

ABSTRACT

The overall aim of this thesis was to gain knowledge about the development of oral health among Swedish women in Gothenburg, 38 and 50 years of age, from 1968/69 to 2004/05, and to elucidate possible impacts of psychosocial factors on oral health.

The specific aims were **(I)** to describe secular trends over time concerning oral health, with regard to number of teeth and socioeconomic status (SES); **(II)** to analyze the relationship between sense of coherence (SOC), dental anxiety (DA) and oral health, measured both subjectively and objectively, and adjusted for SES, in 2004/05; **(III)** to evaluate how oral health-related quality of life (OHRQoL) was related to SOC and DA, subjective oral health, dental care behavior and SES in 2004/05; **(IV)** to analyze perceived mental stress in relation to oral health over time, including considerations concerning smoking and SES. The four scientific papers in this thesis all apply a cross-sectional design.

Results: Paper I revealed a dramatic increase in improved oral health during the 36-year period. The middle-aged women had more remaining teeth and almost none were edentulous in 2004/05 compared with 1968/69. SES also improved, even though inequalities remained over time, and showed better oral health among women with higher SES. Perceived mental stress (**Paper IV**) increased remarkably over time, but was not associated with oral health. However, the analysis showed fewer decayed teeth, less periodontal disease and more remaining teeth in the later examination year in 2004/05 than in 1968/69. Oral health was associated with different social and psychological factors (**Papers II, III**). A strong SOC (**Paper II**) was found to have a protective effect against poor objective (50-year olds only) and subjective oral health, and high DA. A gradient was seen; the lower the SOC scores the lower the SES. DA was related to both poor self-reported and objective oral health. Poor OHRQoL (**Paper III**) was associated with high DA, low SES, irregular dental behavior and poor subjective oral health. A weak SOC and high DA were predictable of poor OHRQoL.

Conclusions: Oral health and socioeconomic status improved over 36 years, but inequalities still remained over time, with better oral health among middle-aged women with higher socioeconomic status. Perceived mental stress increased over time, but was not associated with oral health. The study in 2004/05 showed that a strong SOC, low dental anxiety and good OHRQoL indicated a protective effect on oral health. Low socioeconomic status was related to a weak SOC, high dental anxiety and poor OHRQoL.

Keywords: oral health, socioeconomic factors, number of teeth, sense of coherence, oral health-related quality of life, dental anxiety, women's health, epidemiologic studies, psychological stress, periodontal disease, smoking.

ISBN: 978-91-628-9600-3 (printed)

ISBN: 978-91-628-9599-0 (e-pub)

<http://hdl.handle.net/2077/39558>

SAMMANFATTNING PÅ SVENSKA

Det övergripande syftet med studien var att få kunskap om den orala hälsans utveckling hos 38- och 50-åriga svenska kvinnor från Göteborg, från 1968/69 till 2004/05, samt att belysa psykosociala faktorer eventuella påverkan på munhälsan. Dessutom var syftet att analysera förändringar i socioekonomisk status och upplevd mental stress över tid.

De specifika syftena i de fyra artiklarna, som alla är tvärsnittsstudier, var **(I)** att beskriva förändring över tid avseende oral hälsa (med hänsyn till antal tänder) och socioekonomisk status; **(II)** att analysera sambandet mellan känsla av sammanhang (SOC), tandvårdsrädsla och oral hälsa (subjektiv och objektiv) samt mellan SOC och socioekonomisk status 2004/05; **(III)** att utvärdera hur oral hälsorelaterad livskvalitet är relaterat till känsla av sammanhang och tandvårdsrädsla, samt till subjektiv oral hälsa, tandvårdsbeteende och socioekonomisk status 2004/05; **(IV)** att analysera upplevd mental stress i samband med oral hälsa över tid.

Resultat: Artikel I visade på en dramatisk förbättring av den orala hälsan under den 36-åriga studieperioden. Medelålders kvinnor hade fler kvarvarande tänder och nästan ingen var tandlös 2004/05 jämfört med 1968/69. Socioekonomisk status förbättrades också, även om ojämlikheter fortfarande kvarstod över tid, såsom bättre oral hälsa hos kvinnor med högre socioekonomisk status. Upplevd mental stress (**Artikel IV**) ökade anmärkningsvärt över tid, men något samband med oral hälsa fanns inte. Däremot fanns fler kvarvarande tänder samt färre tänder med karies och tandlossning hos de medelålders kvinnorna 2004/05 jämfört med 1968/69. Oral hälsa var relaterad till flera olika sociala och psykologiska faktorer (**Artikel II och III**). En stark känsla av sammanhang avslöjade en skyddande effekt mot dålig objektiv (endast 50-åringarna) och subjektiv oral hälsa, mot hög tandvårdsrädsla samt mot dålig oral hälsorelaterad livskvalitet. En gradient uppenbarade sig; ju svagare känsla av sammanhang, desto lägre socioekonomisk status. Hög tandvårdsrädsla var förknippat både med dålig självskattad och dålig objektiv oral hälsa. Dålig oral hälsorelaterad livskvalitet var förknippad med hög tandvårdsrädsla, lågt socioekonomisk status, oregelbunden tandvård och dålig subjektiv oral hälsa.

Slutsats: Oral hälsa och socioekonomisk status förbättrades över denna 36-årsperiod, men skillnader kvarstod fortfarande över tid, såsom bättre oral hälsa hos medelålders kvinnor med högre socioekonomisk status. Upplevd mental stress ökade markant över tid, men var inte förknippat med oral hälsa. Studien 2004/05 visade att stark känsla av sammanhang, låg grad av tandvårdsrädsla samt bättre oral hälsorelaterad livskvalitet var relaterat till bättre oral hälsa. Lågt socioekonomisk status var förknippat med svag känsla av sammanhang, hög tandvårdsrädsla och dålig oral hälsorelaterad livskvalitet.

LIST OF ORIGINAL PAPERS

This thesis is based on the following studies, referred to in the text by their Roman numerals I-IV.

- I. Wennström A, Ahlqwist M, Stenman U, Björkelund C, Hakeberg M. **Trends in tooth loss in relation to socio-economic status among Swedish women, aged 38 and 50 years: repeated cross-sectional surveys 1968-2004.** BMC Oral Health. 2013; 13:63. doi: 10.1186/1472-6831-13-63
- II. Wennström A, Wide Boman U, Stenman U, Ahlqwist M, Hakeberg M. **Oral health, sense of coherence and dental anxiety among middle-aged women.** Acta Odontologica Scandinavica. 2013; 71(1): 256-62. doi: 10.3109/00016357.2012.671362
- III. Wide Boman U, Wennström A, Stenman U, Hakeberg M. **Oral health-related quality of life, sense of coherence and dental anxiety: An epidemiological cross-sectional study of middle-aged women.** BMC Oral Health. 2012; 12:14. doi: 10.1186/1472-6831-12-14
- IV. Wennström A, Wide Boman U, Ahlqwist M, Björkelund C, Hakeberg M. **Perceived mental stress in relation to oral health over time among Swedish middle-aged women.** Accepted September 21st for publication in Community Dental Health, 2015.

The papers are printed with kind permission of the publishers.

CONTENT

ABBREVIATIONS	4
DEFINITIONS IN SHORT	5
INTRODUCTION	7
The Population Study of Women in Gothenburg, Sweden.....	7
Oral health.....	8
Oral health-related quality of life.....	10
Sense of coherence	13
Dental anxiety.....	14
Stress	16
Socioeconomic status.....	19
The rationale for this thesis.....	22
AIMS	23
Specific aims	23
MATERIALS AND METHODS	24
Study area	24
Study population and design	25
Non-participation analysis.....	27
Study methods and measurements	28
Paper I.....	29
Paper II.....	29
Paper III	30
Paper IV.....	31
Methodological considerations.....	33
Statistics.....	34
Ethical considerations.....	36
RESULTS	37
Paper I.....	37
Paper II.....	40

Paper III.....	40
Paper IV.....	41
DISCUSSION.....	43
Development over time regarding oral health, socioeconomic status and stress.....	43
Psychosocial aspects on oral health and oral health-related quality of life.....	46
Limitations and strengths	49
Implications for future research.....	51
CONCLUSIONS	53
ACKNOWLEDGEMENTS	54
REFERENCES.....	56
PAPERS I-IV	
APPENDIX	

ABBREVIATIONS

DA	Dental Anxiety
DFS	Dental Fear Survey
OHRQoL	Oral Health-Related Quality of Life
OHIP-14	The Oral Health Impact Profile – 14 items
PSWG	The Population Study of Women in Gothenburg, Sweden
SES	Socioeconomic Status
SOC	Sense of Coherence
WHO	World Health Organization

DEFINITIONS IN SHORT

Periodontal disease	Used synonymously with periodontitis in this thesis.
Periodontal bone loss	Used synonymously with alveolar bone loss. The interproximal bone height was measured on the radiographs.
Self-rated oral health	Used synonymously with self-reported and subjective oral health.



INTRODUCTION

Oral health is an essential component of health throughout life. It means different things in different eras and different cultures. We have heard about Swedish women at the beginning of the last century, who received dental care as teenagers, as a confirmation gift or when getting married. This gift involved having all their teeth extracted and replaced by full dentures. Nowadays, this tradition may be difficult to understand, but it may be seen as a way to assure the receiver of the gift that she would have no further problems or pain from her teeth. The common belief seems to be that oral health has improved during the last decades. But has it improved among women in general, or are there other factors of importance regarding oral health inequalities; for instance social and psychological factors? Systematic epidemiological studies of the oral health of women over time could contribute to answering these questions.

The Population Study of Women in Gothenburg, Sweden

In 1968, Calle Bengtsson, a physician and later on the first professor in Primary Health Care in Gothenburg, initiated The Population Study of Women in Gothenburg, Sweden (PSWG). In Swedish, this study is popularly known as “Kvinnostudien” (The Women’s Study). This thesis is in all parts based on this epidemiological population study.

Previous studies of women in Gothenburg had mainly concerned menstrual blood loss [1], iron deficiency, and changes in plasma lipids during the menopause [2]. Studies on coronary heart disease indicated that this condition increased after the menopause. Since the age groups were too small in these previous studies, no correlational studies could be performed. Hence, the PSWG was initiated, with five age groups that contained a greater number of individuals in each age stratum than the previous studies. The emphasis was placed on the ages around the menopause: 38, 46, 50, 54 and 60 years of age.

The PSWG was a unique study at the time as most previous population studies had involved only men. Therefore, the second reason for the start-up of the PSWG was to address this lack of knowledge about women, utilizing the same methods and the same age groups as in a previous well-known population study of men in Gothenburg, called “Men born in 1913” [3]. Moreover, the PSWG was preceded by a pilot study of medical students. In order to reduce the influence of age differences within each age group, the PSWG was carried out,

in most cases, during a twelve-month period. Altogether, the data comprised more than 1500 variables for each woman.

The PSWG was designed with a randomized selection of a strictly representative sample and had a high response rate (90.1 % in 1968/69). It also displayed uniformity of performance (including standardized procedures) and contained information about non-participants. Hence, valid conclusions may be drawn about the total female population in Gothenburg in these age groups. This also makes it possible to compare the results from the PSWG with those of other population studies, as well as differences between subgroups in the PSWG material [4].

Oral health

Oral health is an essential component of health throughout life, but the concept of oral health has changed over time, as well as the concept of general health.

The two most common models of general health are 1) the biomedical model, and 2) the biopsychosocial model [5, 6]. The medical model separates the body from the mind, therefore called mind-body dualism, and was the traditional way of thinking for many decades. The biopsychosocial model, where health is also defined as social and psychological well-being, together with optimal functioning, started to influence health beliefs in the 1970s. A shift was then seen, from solely referring to disease and cure (biomedical model), to including health and prevention as a complement to disease and cure (biopsychosocial model).

Already in 1946, the WHO defined health as *“a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”* indicating that health is not only regarded as the absence of physical disease, but as something that the individual experiences on a higher level, with regard to the psychosocial aspects of health [7]. Historically, most of the research has focused on diseases and their physical outcome, thereby leaving the most of the WHO definition of health unmeasured [8].

Concerning oral health, the biomedical model refers to the mouth as an anatomical object, more or less isolated from both the body and the person's mind. Thus, the concept of oral health somehow becomes a conceptional anomaly, as we never mention health together with any other body part; for instance “leg health” or “ear health”. In the biopsychosocial model, oral health is now connected to both the body and the mind of the person; hence, linking

oral conditions also to diseases of other body parts and not only to oral diseases. Furthermore, oral health now refers more to the individual and the way in which oral diseases have an impact on health, well-being and quality of life.

This distinction of oral health and general health as two separate domains was strictly organizational in the past. As a result of this, odontology and medicine came to evolve as separate disciplines; thus, today, the term “oral health” is well established instead of “health” only.

Nevertheless, the WHO Report from 2003 concludes that oral health is integral with general health and well-being [9]. In accordance with this report, a Swedish consensus conference also concluded that: *“Oral health is a part of general health and contributes to physical, mental and social well-being with experienced and satisfactory oral functions in relation to the individual’s conditions and absence of diseases”* [10]. Hence, complete oral health means both feeling healthy and being orally sound. However, it is not necessarily the case that diseases influences well-being. For example, an individual with chronic periodontal disease may still feel healthy, and another person may experience poor oral health, despite a sound oral cavity.

Finally, according to the WHO in 2012, oral health is defined as *“... a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual’s capacity in biting, chewing, smiling, speaking, and psychosocial well-being”* [11]. This definition may be criticized for maintaining a strong focus on disease, and even though psychosocial aspects are included, they still originate from the consequences of disease.

Brondani and MacEntee describe oral health in a more positive sense, where the focus is on oral health rather than disease and illness [12]. The ellipses in their model (Figure 1) illustrate the dynamic and overlapping importance of the various components that influence oral health. Hence, oral health is seen as a dynamic process that also includes the positive factors of adjustment, namely coping and adaptation.

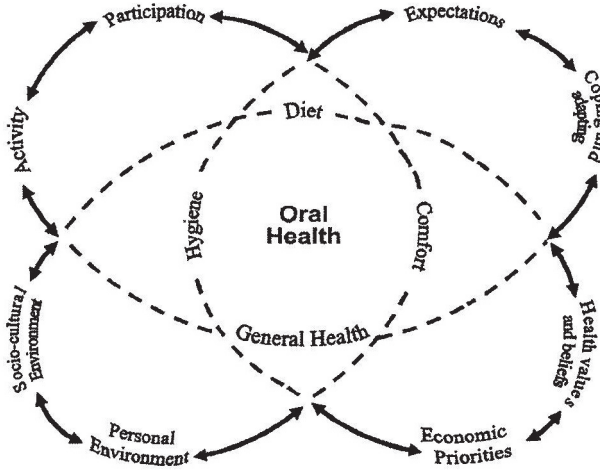


Figure 1. Refined model of oral health. Reproduced by permission from Springer. Brondani & MacEntee. 2014. *Quality of life research* 2014; 23:1093.

In epidemiological studies, objective oral health is usually operationalized as something measurable, either clinically or from radiographs; for example, the number of teeth, the number of decayed surfaces, or a measure of alveolar bone loss according to standardized measuring procedures. Regarding subjective oral health, self-rated oral health is often measured with a single question, which has been shown to be a reliable measure that is strongly correlated to objective health conditions, but also to the perception of individuals' overall health [13, p.193-216, 14]. Subjective health refers to how the individual perceives the psychological and functional impacts of oral conditions [15].

Oral health-related quality of life

To capture the concept of quality of life (QoL), Locker simplified the definition of QoL with the question "How good is your life for you?" [5]. The question deals with life satisfaction, which is influenced by many things, including health. The resulting term is health-related quality of life (HRQoL), which is used in the medical field to describe QoL. HRQoL is sometimes described as being subordinate to QoL, but mostly it is used synonymously with QoL. However, QoL has a meaning only at a personal level and refers to something much broader than health, as health problems and clinical conditions do not necessarily impact on QoL [5, 16]. Allison et al. suggest that QoL is dynamic, that the attitudes vary with time and experience and are modified by different

psychological factors, such as adaptation, coping, expectancy, optimism, self-control and self-concept [17].

Within odontology, QoL evolved into the term oral health-related quality of life (OHRQoL), which is a subjective measurement of how perceived oral health and oral conditions affect the individual's well-being and quality of life. This concept emerged in the late 1970s, when Cohen and Jago elucidated the limitations with simply using the presence or absence of disease to describe oral conditions [18].

OHRQoL is a multidimensional concept, and may change as society changes over time [8, 19]. According to Inglehart and Bagramian (Figure 2), OHRQoL is defined by the individual's assessment of how the following four factors affect his/her well-being: oral functioning, psychological well-being, social well-being, and the experience of pain and discomfort [20].

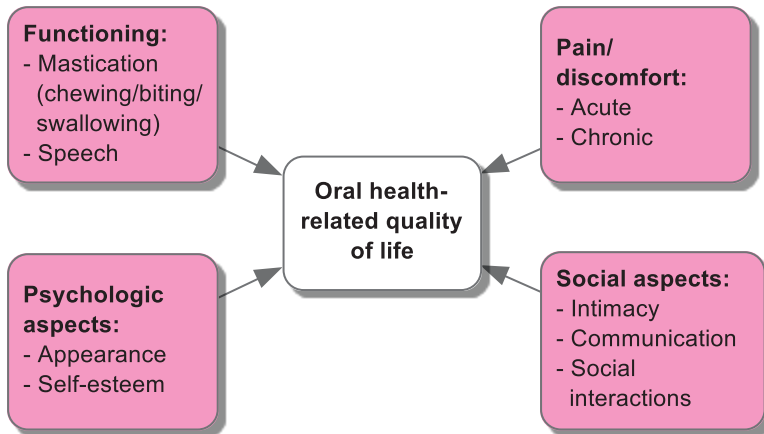


Figure 2. *The main components of OHRQoL. Reproduced by permission from Quintessence Publishing, Inglehart & Bagramian. 2002. Oral Health-Related Quality of Life, p.3. Chicago, Quintessence Publishing Co, Inc.*

OHRQoL is determined by a complete assessment of these four factors. An individual's response to different situations is determined by his/her cultural background, past and current experiences of oral health and care, state of mind and hopes for the future. Consequently, OHRQoL may vary with different

situations related to these four factors. For example, one consideration might be: “When I have lunch, can I chew all food that is served?” [20].

Many different methods to measure OHRQoL have been developed since the late 1970s, when researchers first took an interest in the psychosocial effects of oral diseases [21]. The most common instruments, which have been used and validated in many studies, are the General (Geriatric) Oral Health Assessment Index (GOHAI), with 12 items [22]; the Oral Health Impact Profile (OHIP-49), with 49 items [23], and the shorter 14-item version OHIP-14 [24]; the Oral Impact on Daily Performances (OIDP), with eight or nine items in alternative versions [25]; and the Oral Health-Related Quality of Life-UK (OHQoL-UK), with 16 items [26].

One of the most widely used instruments to measure OHRQoL is the OHIP-14 [24]. It is not only used for English-speaking respondents, but has been translated into several other languages [27, p. 14]. The OHIP-14 is a well-validated method that is short and easy to use and yields good response rates in epidemiological surveys. The OHIP-14 is based on Locker’s oral health model from 1988 [28], which describes a flow of events from disease to handicap or death, based on the effects and consequences of disease. Locker’s oral health model includes seven dimensions that have a disruptive impact on people’s lives: 1) functional limitations (e.g. chewing problems), 2) physical pain (e.g. toothache), 3) psychological discomfort (e.g. embarrassment), 4) physical disability (e.g. swallowing), 5) psychological disability (e.g. fear), 6) social disability (e.g. communication), and 7) handicap (e.g. eating). The OHIP-14 captures two questions from each of these seven dimensions, thus ending up with 14 questions.

One aspect that has been discussed is what these methods really measure, since OHRQoL is not clearly defined and there is no clear distinction between self-reported oral health and OHRQoL. Self-reported oral health deals with symptoms and problems with oral function, whereas OHRQoL deals mainly with the subjective importance and level of satisfaction of oral health and functional status. [15]. Common to all these instruments is that they originate from oral conditions and that their aim is to measure the importance of the problems with regard to how they affect people’s well-being and quality of life [29].

There is a lack of knowledge about oral health-related quality of life and psychosocial factors, such as sense of coherence and dental anxiety.

Sense of coherence

Salutogenesis is a psychological concept that focuses on health rather than disease and is measured by sense of coherence (SOC). Mostly, salutogenesis and SOC are used interchangeably, referring to the same psychological concept. Aaron Antonovsky (1923-1994), professor of sociology, theorized the salutogenic concept in his book, *“Unraveling the mystery of health”*, in 1987 [30]. His interest in salutogenesis began when he studied a group of women who had survived the Nazi concentration camps. The core concept of salutogenesis and SOC is to explain why some individuals stay healthy, even though they experience long-lasting and highly stressful life situations, while others develop disease and illness.

SOC is defined as *“a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that: 1) the stimuli deriving from one’s internal and external environments in the course of living are structured, predictable and explicable; 2) the resources are available to one to meet the demands posed by these stimuli; and 3) these demands are challenges, worthy of investment and engagement”*[30].

This definition consists of three psychosocial dimensions, which together build SOC: comprehensibility, manageability and meaningfulness. According to Antonovsky, the three dimensions of SOC develop during childhood and young adulthood, in close collaboration with the environment. SOC is based on the individual’s accumulated experience of coping with stressors in everyday life, as well as with more extreme difficulties in life. Both internal and external resources are of great importance for the individual’s ability to handle these stressors. Hence, SOC is related to both psychological and social factors. With the entry into adulthood with its long-term commitments to people, social roles and work, the experiences of childhood and adolescence are strengthened or weakened. After the age of 30, SOC is assumed to be constant and can only be changed by dramatic events. In conclusion, individuals with a strong SOC are more able to manage stressful situations, which thereby contributes to health over time.

Since the 1990s, many scientific publications have targeted the SOC concept to reveal possible associations between SOC and different aspects of health and disease [31]. In their systematic review, Eriksson and Lindström conclude that SOC is strongly related to perceived and mental health (psychological measures) and less strongly to objective health indicators (physical health measures) [31]. Moreover, a strong SOC in adults seems to be related to positive oral health behavior [32, 33], positive objective and subjective oral health [34-37], good oral

health-related quality of life [38] and less dental anxiety [37].

Lundberg and Nyström Peck discuss some of the complexity and influences of and on SOC [39]. The determinants of a weak SOC appeared to be 1) older age and low social class, 2) impaired health, and 3) subjective evaluations of living conditions as being poor and changes in living conditions for the worse. No gender differences were found in this study. In conclusion, a weak SOC is formed by social factors and perceived welfare problems. This is in line with other research, whereas SOC could act as a mediator between socioeconomic status and health [35]; thus, SOC is also related to socioeconomic status.

Antonovsky claimed that the core of SOC was the stability of individual SOC scores over time. Some researchers are hesitant about this theory, as some studies have found considerable instability of SOC scores over time [40, 41]. Furthermore, the knowledge about SOC and oral health is limited, and only a few studies have investigated the relationship between SOC and dental anxiety in adults [36, 37].

Dental anxiety

Anxiety, fear and phobia are three closely related psychological concepts. Phobia is the most extreme, and is an excessive, persistent and unreasonable fear of a particular situation or object, that causes an immediate anxiety response [42]. The phobic situation is avoided or endured with intense anxiety or distress, which clearly interferes with the individual's ability to function. Dental phobia is today classified as a psychiatric condition, and since the dental situation often includes injections, pain and blood, it is possible that it covaries with other types of phobias [43].

The concepts of dental anxiety and dental fear are often used interchangeably, as it is difficult in general to distinguish between fear and anxiety. Besides, there are no distinct boundaries between the two concepts in clinical practice. Fear is linked to our fight-or-flight response, resulting in an immediate alarm reaction to a perceived threat. Once the threat is gone, the fear is abated. Concerning anxiety, fear is still a central part, but the anxious response is more extensive and oriented towards cognitive processes, such as negative emotions and catastrophic thinking, in response to an anticipated future threat. The anxiety is irrational, and the perceived feeling is an inability to predict or control future events [44]. These feelings lead to a strong physiological response, such as muscle tension and elevated heart rate. Dental anxiety/fear refers to anxiety/fear that is induced by the dental situation.

The prevalence of high dental anxiety varies among studies, between four and 30%, depending on the measurement method, different cut-off scores and the sample selection [45]. However, for the general adult population, it is more common with a dental anxiety prevalence of about 20 %, and 4-7% for high dental anxiety [46-50]. Self-report questionnaires are commonly used to measure dental anxiety in adults. The two most common instruments are the Dental Anxiety Scale (DAS), with four items [51], and the Dental Fear Survey (DFS), with 20 items [52].

In the dental situation, many things may trigger anxiety, such as the treatment instruments, the social interaction with the dental staff, and feelings of shame and being out of control. Individuals with dental fear/anxiety have to cope with severe stress to manage the terrifying situation of visiting the dentist and/or dental hygienist [53-55].

Dental anxiety is associated with avoidance of dental care [56]. Hence, dental anxiety could be seen as a psychological factor that makes it more difficult to maintain or improve oral health, which may lead to a deteriorated oral health status [57-59].



Figure 3. *The Vicious Cycle of dental anxiety according to Berggren 1984.*

In addition, many individuals with a deteriorated oral health status and incapability to accept dental treatment experience feelings of shame, inferiority, low self-esteem and self-confidence, higher stress levels, and dissatisfaction with life, but also negative social consequences associated with relationships involving intimacy, family, friends and work [60-62]. Consequently, the anxiety is further aggravated, leading to a cycle described as *“The Vicious Cycle”* by Ulf Berggren (Figure 3) [63].

Several studies report that individuals with severe dental anxiety have high levels of missing teeth, decayed teeth/surfaces and periodontal disease [56, 59, 62]. In addition, individuals with severe dental anxiety had fewer filled teeth than the control group, in the study by Hakeberg et al., indicating avoidance of dental treatment [59]. Furthermore, root remnants are more common among those with severe dental anxiety, which is an indication of longstanding avoidance of dental care despite an obvious treatment need [62]. Moreover, Schuller et al. discovered that the higher the levels of dental anxiety, the fewer functional teeth [64]. This reflects both the number of filled and sound teeth to chew with and the esthetic appearance.

Lindmark et al. reported that a stronger sense of coherence was related to less dental anxiety [37]. However, there is still scant research into sense of coherence and dental anxiety. Also, when adding dental anxiety to the two concepts of oral health-related quality of life and sense of coherence, even less information is found regarding the relationship between these three psychological concepts. Dental anxiety is an important field to explore further, with regard both to oral health and psychological and social factors.

Stress

The interpretation of stress has changed over time, as the research within this area has developed. Taylor describes stress as the following: *“Stress is a negative emotional experience accompanied by predictable biochemical, physiological, cognitive, and behavioral changes that are directed either toward altering the stressful event or accommodating to its effects”* [65, p. 113]. Stressful events in the form of external demands (e.g., problems with money, work or health) are called stressors.

Walter Cannon was the first to describe the concept of stress in 1932, as the *“fight-or-flight response”*. Hans Selye made the next contribution to the stress concept in 1956. He suggested that no matter what type of stressor, they all produce the same pattern of physiological changes in the body.

The commonly accepted description of stress today is based on the “*transactional model*” by Lazarus and Folkman, where stress is determined by the person-environmental fit [66]. Their approach is both psychological and physiological, and coping is essential in their definition. Coping refers to how an individual handles the demands and strains at a behavioral and mental level. The focus is on the individual’s interpretation and appraisal of different situations, and the way of handling situations (i.e., coping) that are perceived as threats, or challenges, to health and well-being. Hence, this model includes sociological, psychological and physiological aspects related to stress.

Stress occurs due to a perceived imbalance between demands and resources. We do not have to be exposed to a stressor to suffer stress; it is enough just to anticipate it. The stressor could then be stressful before it has even occurred; sometimes even more so [67]. Also, when the stressful event has passed, the unfavorable aftereffects of stress may persist for a long time. Events that are negative, uncontrollable, ambiguous, or unmanageable tend to cause more stress [65, p. 120-121]. Characteristics that instead can protect against perceived stress are social support, mastery, self-esteem and optimism [68].

The immediate response to stress stimuli is triggered by the sympathetic-adrenomedullary (SAM) system, resulting in elevated levels of epinephrine and norepinephrine in the blood. These catecholamine substances prepare the body for “*fight or flight*”; by for instance, by increasing the pulse, heart rate, blood pressure, and constriction of peripheral blood vessels. They also modulate the immune system. The second step in the stress response is to activate the hypothalamic-pituitary-adrenocortical (HPA) axis, which results in elevated levels of glucocorticoids (e.g., cortisol) in the blood. Cortisol reduces inflammation in case of an injury, conserves stores of carbohydrates and helps the body return to a steady state with normal cortisol levels after the threat has passed [65, p. 116-117].

Stress and health

Under normal circumstances, hormone levels return to base line after the stress stimulus has disappeared. This is very important for our life-support functions, such as organ repair. Individuals can usually adapt to mild stressors, and a short period of stress may enhance the body’s resilience to infection. But long-term severe stress may cause chronic health problems, due to frequently elevated levels of epinephrine, norepinephrine and cortisol. Long-term stress (i.e., chronic stress) can therefore lead to suppression of cellular immune function, cardiovascular diseases and neurochemical imbalances that may play a role in the development of psychiatric disorders. Furthermore, stress (due to cortisol) is

related to depression, diabetes and high waist-to-hip ratio, due to storage of belly fat, and also to problems with verbal functioning, memory and concentration, due to destruction of neurons in the hippocampus [65, p.117, 69].

In addition to the physiological effects, stress may also affect health through different behaviors. Firstly, stress may change health behaviors towards decreased sleep, poor diet, little exercise and increased smoking or alcohol intake. The stress may then affect the use of psychosocial resources, such as reduced optimism, threatened social support and low self-esteem. Finally, stress may interfere with treatment and the use of health services; for instance by a delaying seeking care and a decreased likelihood of ever seeking care [65, p.118].

Stress and oral health

The field of stress and oral health is not as well investigated as that of stress and general health, although some research exists in the field of stress related to periodontal disease. Different studies have shown a relationship between psychosocial stress (for instance, unemployment, marital status) and periodontitis [70, 71], and also between psychological stress and periodontitis [72]. Depression, loneliness and high levels of anxiety are associated with periodontitis, as are greater financial strain and inadequate coping [72-74]. There are also studies that show no association between the risk of periodontal disease and psychosocial factors [75] or psychiatric symptoms, such as depression and hopelessness [76].

Stress seems to influence periodontal health by two pathways, or by a combination of the two: 1) Primarily, by the immune system and the inflammatory response, mostly due to increased cortisol levels [74, 77-79], and 2) secondarily, by a change in health behavior, such as oral hygiene and smoking habits. The second pathway indicates that stressful life events, such as academic stress, are related to poor oral hygiene and oral hygiene neglect [80, 81], and are, accordingly, also associated with periodontal disease and missing teeth [78]. Smoking is an important environmental factor associated with periodontal disease. Thus, both smoking and stress decrease the defense against invading bacteria and, at the same time, increase the inflammatory reaction [82, 83]. However, there is still a lack of knowledge regarding stress and oral health.

Socioeconomic status

The scientific literature presents several sociological and epidemiological ways to measure and operationalize socioeconomic position or status among individuals in a population. Socioeconomic status usually consists of, and is determined by, educational level, social class (mostly assessed from occupation), or income. In general, these measures are closely intercorrelated for populations. Education, in particular, has been shown to be of importance with regard to employment/job status and income. Furthermore, respondents in a survey may perceive the different indicators of socioeconomic status somewhat differently. A possible aspect regarding income is that this variable is more sensitive to respond to and, thus, may include a higher degree of error or noise, i.e., be less reliable. Social class has been used extensively in research, but due to differences in operationalization between countries and cultures, questions may be raised about the comparability between different studies. Marital status is sometimes also included in socioeconomic status [84].

Information on socioeconomic status is gained from self-reported questionnaires, interviews or registers. To assess the development of possible changes over time, there are two ways to measure this difference: absolute and relative. Absolute difference could, for instance, show a decrease in the number of people who die in a disease nowadays, compared with 100 years ago, independently of whether they belong to a high or a low class. The relative difference, on the other hand, shows the ratio between the number of dead people in a high social class and the number of dead people in a low social class today, as well as the same ratio 100 years ago. These ratios of relative difference could end up the same, showing that social inequalities still exist today as they did 100 years ago, despite all the improvements made in different fields over time [84].

Socioeconomic status and health

Socioeconomic inequalities in health still exist today as they did 100 years ago, despite all the efforts to change and improve health, health care, medicine and society. These inequalities are not only seen in Sweden, but also in other countries, regardless of the economic level of the country [85].

Poor health is more common, and morbidity (regarding almost all diseases) and mortality rates are higher among people with low occupational levels than among those with higher occupational levels, which indicate a social gradient concerning social class. These differences are also seen when investigating education and income [84, 86]. Furthermore, these class differences are stable

over time, as is the social gradient. Concerning education, clear differences in death risk are seen between different educational levels; accordingly, people with higher educational levels tend to survive those who only completed compulsory school (low educational level) [87, p. 211-227]. Usually, people with high educational levels tend to end up in favorable class positions, which, in turn tend to result in a high income. However, it is not the money itself or the educational diploma that contributes to better health, but the knowledge, economic resources and social support that help us to act in certain ways to avoid the risk of disease and death, and instead protect health [84, p.54].

Some health behaviors are also associated with socioeconomic status; for instance, physical activity and smoking. Charafeddine et al. showed that the prevalence of daily smoking declines with increased educational level [88]. Smoking is seen as a risk factor for general health and is associated, for example, with lung disease, lung cancer, heart disease and stroke [89].

Socioeconomic status and oral health

Several studies have revealed a gradient between socioeconomic status and oral health, in the sense that the lower the socioeconomic status, the worse the individuals' oral health [90-93]. This may be explained by material welfare, behavior and lifestyle, but also, to some extent, by individual and structural factors at a societal level [94]. Hugoson et al. found that marital status in the form of the loss of a spouse was associated with oral health risks, such as an increased risk of severe periodontal disease [71]. Low socioeconomic status also appears to be related to dental anxiety [48]. Concerning smoking and oral health, smoking is a strong risk factor for impaired oral health, such as tooth loss [95] and periodontal disease [89, 96].

Beside the hereditary factors, the determinants of health/oral health are seen as interplay between the individual and society. Hence, it is a complex range of factors; for instance, psychological, social, environmental, economic, cultural and political factors that determine the health status of individuals and populations, which Dahlgren and Whitehead show in Figure 4 [97]. When individuals have no resources and opportunities for change, health knowledge and awareness are of little value. Their behavior is instead determined by the conditions under which they live. Hence, to tackle oral health inequalities, preventive clinical measures and behavioral approaches are insufficient; instead, the focus must be to improve living, working and social conditions [98, p.18-21].

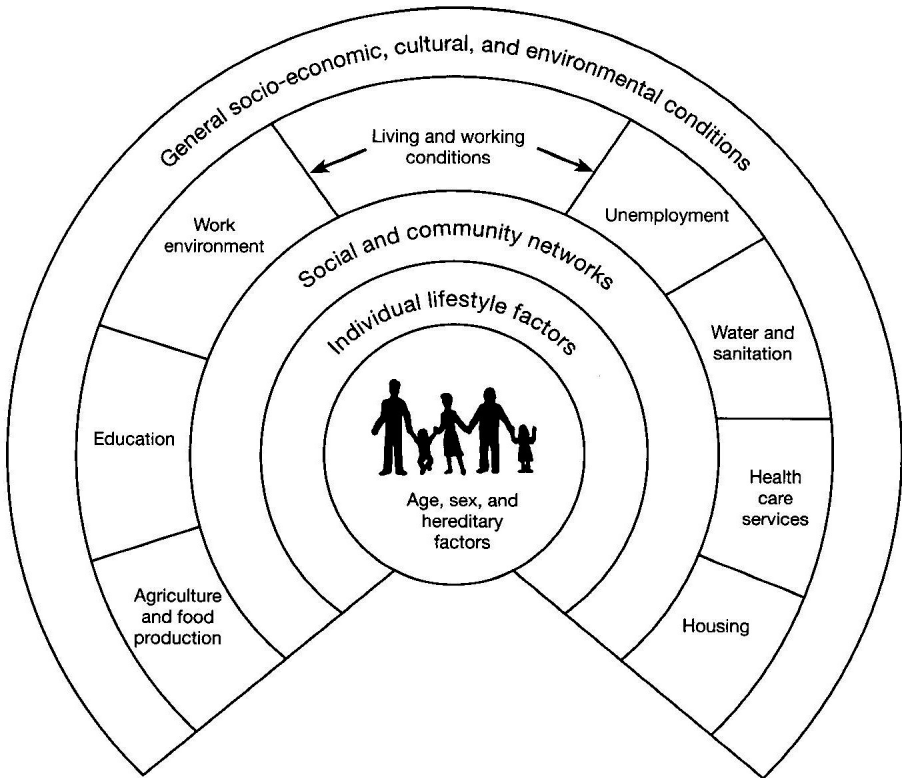


Figure 4. *Determinants of health. Based on Dablgren, G. European Health Policy Conference: Opportunities for the Future. Volume II-Intersectoral action for health. Copenhagen, WHO Regional Office for Europe, 1995.*

Even though there are studies that reveal associations between socioeconomic status and oral health, few report on these relationships in women over time. For this reason, further research needs to be done in this field.

The rationale for this thesis

Epidemiological studies are needed to assess improvement or deterioration over time; i.e., to know to where resources should be allocated in society. Many factors influence oral health, for instance, well-known factors such as diet and tooth-brushing. However, many other aspects also impact on oral health, among them different social and psychological factors. A better understanding of how such factors affect oral health can lead to substantial improvements in the understanding of the patient's behavior, expectations and perceptions in the treatment situation, but also in society as a whole. In the long run, this may contribute to both improve oral health and well-being for the individual as well as for society.

This thesis aims to elucidate further the development of oral health over time, as well as the possible impact on oral health of socioeconomic and psychosocial factors.

AIMS

The overall aim of this thesis was to describe secular trends in oral health, socioeconomic status and perceived mental stress in Swedish women from Gothenburg, aged 38 and 50 years, during a 36-year period, from 1968/69 to 2004/05. Furthermore, the aim was to analyze the relationship between different social and psychological factors (such as sense of coherence, dental anxiety, oral health-related quality of life and dental behavior), and their relation to oral health and socioeconomic status among middle-aged women in 2004/05.

Specific aims

Paper I

The aims of this study were to describe secular trends in oral health regarding the number of remaining teeth, and to analyze differences in socioeconomic status among 38- and 50-year old women, and whether the relationship between socioeconomic status and oral health has changed over a 36-year period.

Paper II

The aims of this study were to analyze the relationship between sense of coherence, dental anxiety and oral health among middle-aged women, measured both subjectively and objectively, and adjusted for socioeconomic status in 2004/05.

Paper III

The aims of this study were to evaluate how oral health-related quality of life is related to sense of coherence and dental anxiety, as well as to subjective oral health, dental behavior and socioeconomic status among middle-aged Swedish women in 2004/05.

Paper IV

The aim of this study was to analyze perceived mental stress in relation to oral health, including considerations concerning smoking and socioeconomic status, among Swedish middle-aged women over a 36-year period. Oral health was expressed as the number of teeth, number of filled teeth, number of decayed teeth, and the level of alveolar bone loss.

MATERIALS AND METHODS

The studies of this thesis are all part of the Population Study of Women in Gothenburg, Sweden, which began in 1968 and was based at the University of Gothenburg.

This thesis used an observational repeated cross-sectional design in order to describe oral health in relation to different social and psychological factors in 38- and 50-year old Swedish women. The analyses in Papers I and IV are based on repeated cross-sectional studies over a 36-year period, in 1968/69, 1980/81, 1992/93 and 2004/05, and in Papers II and III, the analyses are cross-sectional from the study in 2004/05.

Study area

The women invited to participate in this large population study were inhabitants in Gothenburg, which is a city situated on the west coast of Sweden.



Gothenburg is the second largest city in Sweden, and had approximately 445 000 inhabitants in 1968. In 2004, the city had grown to about 510 000 inhabitants. Today, there are approximately 550 000 inhabitants in the urban area (970 000 in the metropolitan area).

The city of Gothenburg is dominated by its harbor and large industries. Furthermore, it is also the site of the largest hospital in northern Europe, the Sahlgrenska University Hospital. Two universities are located in Gothenburg: the University of Gothenburg and Chalmers University of Technology. Since 2001, both the Faculty of Medicine and Odontology are included in the Sahlgrenska Academy, which is the Faculty of Education and Research in Health Sciences at the University of Gothenburg.

The Quacquarelli Symonds (QS) Company performs an annual ranking of universities in over 30 subject areas. They concluded in 2015 that the University of Gothenburg is the world's third best university in dentistry, with respect to research and reputation [99]. The Institute of Odontology also publishes over 40 % of the Swedish scientific articles in the area of odontology.

Study population and design

The Population Study of Women in Gothenburg, Sweden (PSWG), is an epidemiological study that was initiated in 1968 as a combined medical and dental health examination of women. A systematic sampling procedure was used to randomly select these women from the Swedish Tax Agency Register, which was, and still is, kept up to date in accordance with the Swedish law. The systematic randomized sampling procedure meant that women born on dates of the month evenly divisible by six, and living in Gothenburg, were selected [4].

The selected women were invited to the research unit, where all the health examinations were performed, through a letter and subsequently by a phone call, offering them a free health examination. They were also given a description of the study. Altogether, 1622 women aged 38, 46, 50, 54 and 60 years were invited to the first study in 1968/69. Of these women, 1417 participated in the dental part of the study, which corresponds to a participation rate of 87.4 % [4, 100]. This high participation rate, in combination with the sampling method, indicates that the sample was representative of women in the different age groups in Gothenburg.

The study was performed with the same design with 12-year intervals, in 1980/81, 1992/93 and 2004/05. In the dental part of these last three studies, the total number of women participating in each examination year was 1198, 994 and 500 (2004/05 only 38- and 50-year olds were included), respectively (Table 1).

Table 1. Number of women participating in the dental part of the PSWG, including year of birth and age. (* total new group, ** including women who have moved to Gothenburg after the previous study/ies).

Born	1968-69		1980-81		1992-93		2004-06	
	Age	Number	Age	Number	Age	Number	Age	Number
1966							38*	207
1954					38*	66	50**	293
1942			38*	109	50**	98	62	
1930	38	356	50**	323	62	268	70	225
1922	46	421	58	305	70**	275	82	178
1918	50	390	62	295	74	201	86	124
1914	54	172	66	125	78	70		
1908	60	78	72	41	84	16		
	38-60	1417	38-72	1198	38-84	994	38-86	1027

New groups of 38- and 50-year old women, living in Gothenburg, were invited to all the studies with the same inclusion criteria as in the first study in 1968/69. This was done to ensure representativeness in all subsequent examinations/studies. Women aged 50 who had participated in earlier studies in the PSWG were invited to the last study, in 2004/05, even if they had moved outside Gothenburg. Detailed information on the sampling procedure has been published previously [4, 101-103]. In 2006 (Table 1), subsequent examinations of women aged 70, 82 and 86 were carried out, but those ages are not relevant in this thesis, nor is the study performed in 2006.

This thesis concerns comparable groups of middle-aged women, 38 and 50 years old, in Gothenburg. Table 2 shows the number of participants and the participation rate in these age groups in the four different studies, in 1968/69, 1980/81, 1992/93 and 2004/05.

Table 2. Number of women aged 38 and 50 years who participated in the dental examinations in the Population Study of Women in Gothenburg, in the studies in 1968/69, 1980/81, 1992/93 and 2004/05.

		1968/69	1980/81	1992/93	2004/05
Age 38	Participants	356	109	66	207
	Participation rate	87.5%	75.2%	71.7%	59.5%
Age 50	Participants	390	323	98	293
	Participation rate	89.4%	76.4%	77.2%	57.7%

Non-participation analysis

In each study year, non-participation analyses were performed to show the representativeness of the study groups. The analyses included information about mortality, socioeconomic status, number of teeth, smoking habits, etc. The information was obtained through telephone calls or by mail and from inpatient and outpatient records, but also from the local fiscal authority [101, 103, 104].

In 1968/69, single women were over-represented among the non-participants [4]. In the follow-up studies in 1980/81 and 1992/93, a larger proportion of the non-participants were edentulous, and among the dentate individuals, the non-participants had significantly fewer teeth and fewer filled teeth [101, 104, 105]. A larger proportion of the non-participating women were also smokers but showed no significant differences concerning socioeconomic status. In 2004/05, the non-participants had lower incomes and more of them were immigrants [103].

Study methods and measurements

The participating women passed a series of medical and dental examinations, which were performed by medical (physicians, nurses, psychologists, psychiatrists, physiotherapists and nutritionists) and dental staff. A radiographic dental examination was also included and was performed with a panoramic radiograph. The women completed questionnaires concerning their general health, lifestyle and case history, as well as dental health and dental behavior. The studies in 1992/93 and 2004/05 also included a clinical examination of the dentition. Different variables were studied in the four papers and are all presented in Table 3.

Table 3. Overview of the variables in the four papers: I-IV. SES = socioeconomic status.

	Variables	Paper I 1968/69 to 2004/05	Paper II 2004/05	Paper III 2004/05	Paper IV 1968/69 to 2004/05
SES	Marital status	X	X	X	
	Social class	X	X	X	
	Education	X	X	X	X
	Income	X	X	X	
Objective oral health	Number of teeth	X	X		X
	Decayed approximal surfaces		X		
	Filled surfaces		X		
	Apical periodontitis		X		
	Periodontal (alveolar) bone loss				X
	Number of decayed teeth				X
	Number of filled teeth				X
Subjective oral health	Dental visiting habits			X	
	Chewing ability			X	
	Esthetic aspect of oral status			X	
	Self-reported mouth dryness			X	
	Self-reported susceptibility to caries			X	
	Self-reported susceptibility to periodontitis			X	
	Self-reported oral hygiene			X	
	Self-reported oral health		X	X	
Psychosocial factors	Sense of coherence, SOC (SOC-13)		X	X	
	Dental anxiety, DA (DFS)		X	X	
	Oral health-related quality of life, OHRQoL (OHIP-14)			X	
	Perceived mental stress				X
	Smoking				X

Paper I

This paper reports on the 38- and 50-year old women in the studies in 1968/69, 1980/81, 1992/93 and 2004/05. **Socioeconomic status** (i.e., marital status, social class, education, and income) was measured on the basis of the self-reported questionnaires.

The number of teeth was assessed from the panoramic radiographs.

Marital status was given as not living together (i.e., living alone, unmarried, divorced, widowed or married but not living together), or living together (i.e., co-habiting, married or in partnership).

Social class was divided into three categories. In the studies in 1968/69 and 1980/81, the married women reported their husband's occupation, and the unmarried women reported their own occupation. In 1992/93 and 2004/05, the women's own occupation was reported in the first place. This information was transformed according to Carlson's standard occupation grouping system [106]: low social group (skilled and unskilled workers), medium social group (small-scale employers, lower rank officials, foremen), and high social group (large-scale employers and high or intermediate rank officials).

Educational levels were based on years of school attendance and reported as: low (1-9 years), medium (10-12 years), and high level of education (≥ 13 years).

Income was measured in thousands of Swedish kronor (SEK) per year. The value in 1968/69 was recalculated according to the consumer price index [107], to be comparable to the value in 2004/05 (the value in 2004/05 was 7.4 times higher than in 1968/69). Information about income was not available for the studies in 1980/81 and 1992/93.

Paper II

This paper reports on women, 38 and 50 years old, in the study in 2004/05.

The number of teeth, apical periodontitis, decayed approximal surfaces and filled surfaces (including amalgam, composite and crowns) were assessed from the panoramic radiographs. For the analysis, the number of teeth was dichotomized into 0-25 and 26-32 remaining teeth. This cut-off point was chosen as -1 SD from the mean number of teeth for the whole group of women. Apical periodontitis was also dichotomized, here as no apical periodontitis and one or more apical periodontitis.

Self-reported oral health was measured with a written single question where the participants/women rated their oral health as poor, moderate, good or very good. This variable was then dichotomized into poor (poor and moderate) and good (good and very good) oral health in the analysis.

Sense of coherence, SOC, was measured with a questionnaire, which originated from Antonovsky's original 29-item SOC questionnaire [30]. This short 13-item version (see Appendix) [108], consists of 13 items related to the three interrelated SOC components: comprehensibility (five items), manageability (four items) and meaningfulness (four items). Each of these items was scored on a unitary scale, the Likert scale, which ranged from 1-7 points. This gives a total range from 13-91 points for the SOC score. A higher SOC score indicates a stronger sense of coherence.

Dental anxiety, DA, was measured with the Dental Fear Survey (DFS) (see Appendix). The DFS consists of 20 items that cover the following aspects of dental anxiety: anticipatory anxiety, physiological reactions and situational anxiety [52]. Each response to the items was scored from 1 (no anxiety) to 5 (high intensity of anxiety), which gives a score from 20-100. A DFS score of 60 or higher was used to assess dental anxiety [109]. Hence, 60 was the cut-off point used to detect dental anxiety in this study (Paper II).

Socioeconomic status: marital status, social class, education, and income were measured from questionnaires in the same way as in Paper I. Income was divided (in Paper II) into three categories; low, medium and high, where low income corresponded to the lowest 20 % and high income to the highest 20 % of the reported income for the total group of women.

Paper III

This paper reports on women, 38 and 50 years old, in the study in 2004/05.

Oral health-related quality of life, OHRQoL, was measured with the Oral Health Impact Profile (OHIP-14) (Appendix) [110]. This questionnaire consists of 14 items that describe several dimensions of health-related quality of life in an oral health context [24]. Each of these items was scored on a five-degree scale, from 1 (never) to 5 (very often), which indicates the degree of severity at which individuals perceive their oral conditions/symptoms and how these affect life situations. This gives a total range from 14-70 points for the OHIP-14 score. In Paper III, the scores were dichotomized for each item: 0 for scores 1 to 2 (never to seldom) and 1 for scores 3 to 5 (sometimes to very often), as women who had a score of 3-5 were considered to have problems. The scores were then

summed up for all 14 items, which gave scores between 0 and 14. 62.5 % of the participants scored 0, which means that they had experienced no symptoms or dysfunction at all from their mouth/teeth. This method of calculating the OHIP-14 score is similar to a method previously used by Savolainen et al. [38].

Subjective oral health, such as chewing ability, esthetic aspects of oral status, self-reported oral hygiene, self-reported mouth dryness, self-reported susceptibility to caries and periodontitis, and dental visiting habits were measured on a 4- or 5-degree scale from low to high. It was then dichotomized into poor or good for the first three variables, and into yes or no for the next three variables. Regarding dental visiting habits, the question concerned regularity of dental care, and this was dichotomized into regular (dental care at least every second year) and irregular (less often).

Sense of coherence, dental anxiety and self-reported oral health were measured in the same way as in Paper II.

Socioeconomic status: marital status, social class, education and income, were measured in the same way as in Paper I. Income was then trichotomized in the same way as in Paper II.

Paper IV

This paper reports on the total group of middle-aged women, 38 and 50 years old, in the studies in 1968/69, 1980/81 and 2004/05.

The number of teeth, filled teeth and decayed teeth (approximal and/or occlusal caries) were assessed from the panoramic radiographs.

Smoking was assessed in the same way from the questionnaires, throughout the three studies. In paper IV, smoking was categorized into three groups:

- 0 = non-smokers: have never smoked;
- 1 = previous smokers: have smoked, but not in the last 1-15 years;
- 2 = smokers: still smoking or quit smoking during the past year.

Perceived mental stress was measured with a single question from the questionnaires, in the same way in 1968/69, 1980/81 and 2004/05 (Figure 5). In paper IV, perceived mental stress was categorized into three groups:

- 1 = No stress (level 0): never experienced any period of stress;
- 2 = Moderate stress (level 1-2): experienced a period of stress in life;
- 3 = High stress (level 3-5): experienced several periods of stress during the last five years or have lived under constant stress during the last one to five years.

Have you experienced any period of mental stress... (one month or more), and by stress we mean that you have been: Irritable, Tense, Nervous, Anxious, Afraid, Anguished and/or Sleepless ...**connected with concern for:** Your work, Your health, Your family, Conflict with the people around you (at home, at work) and/or another cause. **Tick one option:**

- | | | | |
|----------------------------------------------------------------------------------------|---|----------------------------|----------------------------------|
| <input type="checkbox"/> never experienced any period of stress | } | No perceived mental stress | |
| <input type="checkbox"/> experienced a period of stress | | } | Moderate perceived mental stress |
| <input type="checkbox"/> experienced a period of stress during the last 5 years | } | | High perceived mental stress |
| <input type="checkbox"/> experienced several periods of stress during the last 5 years | | } | |
| <input type="checkbox"/> living under constant stress during the last year | | | |
| <input type="checkbox"/> living under constant stress during the last 5 years | | | |

Figure 5. *The question about perceived mental stress from the questionnaires, and Paper IV's categorization of perceived mental stress into three groups.*

The level of alveolar bone loss was measured from the panoramic radiographs with the Schei ruler [111, 112]. The Schei ruler used in Study IV was divided into five equal parts, which measured the interproximal bone height of each tooth. Grade 1 was categorized as no alveolar bone loss and grade 5 as the worst alveolar bone loss (where the remaining alveolar bone is only 1/5 of the root length or less). The mean value regarding existing teeth (i.e., missing teeth not included in the mean value) and the worst value were calculated for each woman. The worst value refers to the tooth with the highest level of alveolar bone loss, which determines the woman's periodontal status.

The worst value, together with no teeth at all (edentulous women), was then categorized into 4 groups:

- 0 = no teeth, i.e. edentulous women;
- 1 = healthy/low bone loss (no bone loss/not more than 1/5 of the root length);
- 2 = moderate bone loss (2/5 of the root length);
- 3 = high bone loss (3/5, 4/5 or 5/5 of the root length).

Educational levels were measured in the same way as in Paper I.

Methodological considerations

The educational system has changed in Sweden during the 36-year period investigated in this thesis. This may have influenced the results, as very few of the individuals - and very few women, in general - attended university (high educational level) in 1968/69. All-girls schools in Sweden were considered a high educational level in those days, but based on our categorization of the number of years at school, they would fall in the category of medium educational level. Hence, more women would belong to the group of high educational level in 1968/69, which may have resulted in a slight overestimation of the increase in the number of years women go to school “nowadays” (2004/05 compared with 1968/69).

The questionnaires consist of self-reported information and, as society changes over time, the interpretation of the questions may also change among the women due to context influences. The same applies to the question about perceived mental stress, which is mentioned in the discussion section. A validated instrument on stress with several questions about perceived mental stress would have been desirable, in order to try to elucidate different aspects of the perception of stress among the women. Still, since 1968/69, there is at least a question about stress, and this single question has been the same in all the subsequent examinations (1980/81 and 2004/05).

In the first three studies (1968/69, 1980/81, and 1992/93), the participation rate was high; however, in the last study in 2004/05, it declined remarkably. This may be due to more women working outside the home, thus being busier, which results in a lack of time for participating in health examinations to the same extent as the housewives in 1968/69. Still, a participation rate of 60 % is considered moderately high and ensures good representativeness among middle-aged women in Gothenburg.

In Paper IV, the educational level was chosen to represent socioeconomic status, as education, specifically, has been shown to be of importance with regard to employment/job status and income, as mentioned in the introduction. Furthermore, the measures of education and social class are often inter-correlated, but even so, the results may differ depending on what measure is used. One can only speculate on whether social class and educational level meant the same thing to women in 1968/69 as in 2004/05. In the first study, the social class was based on the husband’s occupation if the woman was married, which many women were at the time. The educational level was instead based on the woman’s number of years at school, but not many women belonged to the category of high educational level in 1968/69. In 2004/05, both

social class and educational level were based on the woman's own occupation and number of years at school. This leaves us with the question whether different measures in different time periods are more or less representative of the socioeconomic status among middle-aged women. There is no answer to this question, unless new analyses are performed. The results of such new studies might reveal whether the results in Paper IV would have been the same, regardless of the chosen socioeconomic status.

Another methodological aspect is whether panoramic radiographs (used throughout the whole PSWG) are a good method for mirroring objective oral health. Intraoral radiographs have been suggested to reveal approximal caries and interproximal bone height better in certain areas, such as the upper premolar region and the frontal upper and lower regions. Due to the radiological method, the depicted layer in the frontal area is thin and there is overlapping in the premolar region. Studies have shown that for assessments of periapical lesions and interproximal bone height (measuring alveolar bone loss), panoramic radiographs display reliable agreement with intraoral radiographs; however, it is less good at detecting approximal caries [113-115]. Accordingly, panoramic radiographs were considered a useful tool in epidemiological studies, except with respect for carious lesions [115]. When assessing approximal caries, caution must be observed with regard to the interpretation of the results. For this reason, the guidelines in this thesis were the following: if you are uncertain of whether it is a decayed surface or not, do not register it. The same goes for a measure that is between good or bad; always choose the better one. This means that better oral health may be slightly overestimated.

Statistics

The collected data were analyzed using SPSS (Statistical Package for the Social Sciences). For the level of statistical significance, the p-value was set to 0.05.

To summarize and describe objective and subjective oral health, socioeconomic status and psychosocial factors, the statistical analyses in all papers consisted of descriptive statistics and inference testing using the t-test (not in Paper IV), the chi-square test and the one-way analysis of variance including a post-hoc test (LSD). Spearman's correlation test was performed to determine the strength of the relationship between income and the number of teeth in Paper I. The Mann-Whitney test was also used in the analyses of the number of teeth and marital status in Paper I. Fisher's exact test was used to analyze the variable of age in relation both to objective (Paper II) and subjective (Paper II and III) oral health.

Multivariate analyses were performed with logistic regression in all papers. To assess the model fit, the test statistic Nagelkerke's R^2 was used to estimate the amount of variability accounted for by the logistic models.

Paper I: Different categorizations were made of the outcome variable 'number of teeth' (Table 4 in Paper I). Thus, the number of teeth was categorized into a binary variable: 1+ vs. 0 teeth (Model I); 11+ vs. 0-10 teeth (Model II); 21+ vs. 0-20 teeth (Model III); and 25+ vs. 0-24 teeth (Model IV). The examination years were included in the models for a time series analysis (linear trend over time). This covariate was used as a continuous variable, with 1968 = 1, and up to 2004 = 4, indicating a change in the odds ratio per every twelve years. The other independent variables included were age, social class and marital status.

Paper II: The multiple logistic regressions included two models (Table III and IV in Paper II), with the binary logistic regressions using the number of teeth and self-rated oral health, respectively, as the dependent variables, and marital status, educational level and SOC scores as the independent variables. In a second step, dental anxiety was entered in the models to analyze the potential impact of dental anxiety on oral health/disease. The socioeconomic status variables indicated high collinearity and parallel results with regard to SOC; thus, the choice was made to use education in the models. Both models indicate the same results, irrespective of the dependent variable; with the exception that marital status was not a significant predictor in the self-reported measure of oral health.

Paper III: The OHIP-14 score was used as the dependent variable in the statistical analysis (Table 4 in Paper III). A hierarchical regression modeling strategy was applied, by first including the socioeconomic variables, then checking how much of the variability in oral health-related quality of life was accounted for by income (as the chosen socioeconomic variable), dental anxiety, dental visits and sense of coherence. In the last step, income (as the chosen socioeconomic variable), dental anxiety, sense of coherence, and self-reported oral health, as well as chewing ability and self-reported susceptibility to caries and periodontitis, were included in the full model, thereby examining the contribution of each specific measurement area of interest.

Paper IV: The multivariate analyses included three models (Table 4 in Paper IV), with binary logistic regressions using the number of teeth, the number of decayed teeth and periodontal bone loss (alveolar bone loss) as the dependent variables, as an indication of oral health. The dependent variables were dichotomized: the number of teeth into 0-20 and 21-32 teeth (a functional dentition was determined to be 20 teeth [116]); periodontal (alveolar) bone loss

into low and moderate bone loss vs. high bone loss; and the number of decayed teeth into 0 vs. 1 or more decayed teeth. The independent variables used were perceived mental stress, educational level, smoking, year of examination, and age.

Also, inter-variation analyses were made between the researchers who measured the interproximal bone height with the Schei ruler (kappa 0.64 for tooth surface 21 distally and 0.67 for tooth surface 36 mesially), as well as intra-variation analyses (kappa 0.65 for tooth surface 21 distally and 1.0 for tooth surface 36 mesially). The number of teeth, filled teeth and decayed teeth from panoramic x-rays had intra-class correlations of 1.0, 0.99 and 0.92, respectively, in the intra-variation analyses.

Ethical considerations

The Regional Ethical Review Board in Gothenburg, Sweden, approved the Population Study of Women in Gothenburg, Sweden (D-nr 179-92, 134-05, T 453-04). Participation in the studies was voluntary, and all participants provided written informed consent after information, verbally and in writing, about the purpose of the studies. To ensure as much confidentiality as possible, anonymous patient characteristic forms and anonymous questionnaires were used for the data collection. The participants were assured that they could withdraw from the study at any time, without explaining the reason why, and that this would not influence their future medical or dental care.

RESULTS

All the statistical results accounted for in this section are statistically significant ($p < 0.05$), unless otherwise stated.

Paper I

The two groups of middle-aged women, 38 and 50 years old, were compared over a 36-year period: from 1968/69 to 2004/05. The mean number of teeth increased (Table 4), whereas edentulism decreased over time for both age groups; also, the later the examination year, the greater the number of remaining teeth. Among the 50-year old women, 18.2 % were edentulous in 1968/69, but only 0.3 % in 2004/05. Among the 38-year old women, 3.9 % were edentulous in 1968/69 and none in 2004/05.

Table 4. *Number of women aged 38 and 50 years who participated in the dental examinations in the Population Study of Women in Gothenburg, and the mean and median number of teeth and standard deviation (SD) in the studies in 1968/69, 1980/81, 1992/93 and 2004/05 *. The analyses of variance method was applied, including a post-hoc analysis (LSD).*

		1968/69	1980/81	1992/93	2004/05
Age 38	Mean number of teeth	22.2	24.9	28.1	29.0
	Median	24.0	27.0	28.0	29.0
	SD	7.0	5.9	2.2	2.5
Age 50	Mean number of teeth	14.6	20.9	23.9	27.3
	Median	17.0	23.0	26.0	28.0
	SD	9.6	7.2	6.2	3.3

**Statistically significant differences ($p < 0.05$) concerning the mean number of remaining teeth between all examinations and age groups except between 1992/93 and 2004/05 for the 38-year olds.*

Concerning socioeconomic status, proportionally more women were living alone, and more women were categorized in a higher social group and higher educational level over time, in both age groups. In 1968/69, a large majority of the women (87 % for the 38-year olds and 86 % for the 50-year olds) had only attended elementary school (low educational level), but in 2004/05, the situation was the opposite. Only 3 % of the women aged 38 years and 11 % of the women aged 50 years belonged to the low educational group in 2004/05. Instead, 51-56 % had a high educational level, such as a university degree. Most of the women had their own income in 2004/05 and a higher income than in the study in 1968/69 (calculated according to the Consumer Price Index [107]).

Concerning socioeconomic status and the number of teeth, there was a relationship over time for the 50-year old women between fewer teeth and low social class (Figure 6), and low educational level and living alone. For the 38-year old women, a relationship between fewer teeth and low social class (Figure 7) and a low educational level was only seen in 1968/69 and 1980/81. There was no relationship between the number of teeth and marital status in any of the four studies for the women aged 38 years. Regarding the number of teeth and income for the household (woman and husband together), there was only a slight indication that the higher the income, the more remaining teeth among the women.

Multivariate analyses revealed that the risk of being edentulous or of having fewer remaining teeth was higher for women in lower social classes or women living alone. This was independent of age group in all the studies over the 36-year period. Furthermore, the time trend analysis indicated that the women had fewer lost teeth, irrespective of age, marital status and social class, in the later examination years.



Figure 6. Relationship between the mean number of teeth and social class among women aged 50 years. Significance ($p < 0.05$) between: a = all classes, b = high and low classes, c = medium and low classes.

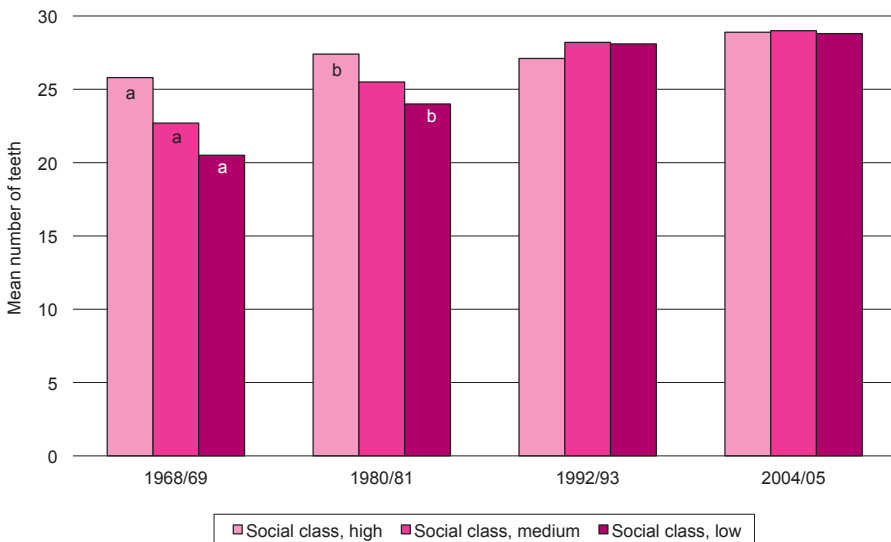


Figure 7. Relationship between the mean number of teeth and social class among women aged 38 years. Significance ($p < 0.05$) between: a = all classes, b = high and low classes.

Paper II

For the total group of middle-aged women (38 and 50 years old), there were substantial differences in sense of coherence (SOC) scores between different socioeconomic levels. The women scored a higher SOC when they lived together with someone, belonged to a higher social class, had a higher educational level and a higher income. Also, a gradient in SOC levels was seen for the respective variables of socioeconomic status (except for marital status), with lower SOC scores for lower socioeconomic status. Concerning age, the 50-year olds showed the same results as the total group, but the 38-year olds only showed differences between SOC level and social class.

Oral health, measured as approximal caries, apical periodontitis and filled surfaces, was not associated with SOC in this study. However, the number of teeth was related to SOC for the 50-year old women, where more missing teeth revealed a lower SOC level. Furthermore, in both age groups, low self-reported oral health was associated with a lower SOC level.

Women with high dental anxiety scored a lower SOC in both age groups. For the total group of women, a greater proportion of those with high dental anxiety belonged to a lower social class, had lower educational levels and lower income. This was also seen for the 50-year olds, but not for the 38-year olds. Moreover, high dental anxiety was related to poor self-perceived oral health, regardless of age. Women with high dental anxiety also had fewer teeth, more filled surfaces and more approximal caries.

The multivariate models showed that higher SOC levels were associated with better oral health, as estimated both by objective and subjective measures, while the reverse results were seen for dental anxiety. Thus, women who reported high dental anxiety were more likely to have fewer teeth and poor perceived oral health, taking socioeconomic status into account. Concerning socioeconomic status, educational level had a gradient effect: the more years at school, the greater the likelihood of more teeth or better self-reported oral health. Also, living together was predictable of more remaining teeth.

Paper III

Poor oral health-related quality of life (OHRQoL) was related to low socioeconomic status, such as low social class, low educational level and low income, for the total group of middle-aged women (aged 38 and 50 years).

Sense of coherence (SOC) showed an association with both OHRQoL and dental anxiety. A low SOC level was predictable of poor OHRQoL and high dental anxiety. Furthermore, poor OHRQoL was correlated with high dental anxiety (higher mean DFS values on the continuous scale).

Subjective/self-reported oral health and dental behavior was also related to OHRQoL. Problems with oral hygiene, chewing ability, dry mouth, esthetic aspects of oral status, high self-reported susceptibility to caries and periodontitis, poor self-reported oral health, and irregular dental visiting habits, were all associated with poor OHRQoL. When taking age into account, the 50-year old women reported a lower educational level, poorer self-rated oral health, more dry mouth problems and more susceptibility to periodontitis than the 38-year old women.

Three different multivariate models of OHRQoL were made, with regard to socioeconomic status, behavioral factors and oral function, respectively (Table 4 in Paper III). Concerning the influence of socioeconomic status on OHRQoL (Model 1), the strongest factor was income, which also revealed a gradient effect: the lower the income the higher the risk of poor OHRQoL. In Model 2, low income was still a predictor of poor OHRQoL. High dental anxiety and irregular dental care indicated an almost four-fold risk of poor OHRQoL, compared with low dental anxiety and regular dental care behavior. On the other hand, high SOC scores indicated a protective effect against poor OHRQoL. In Model 3, poor oral function, measured as chewing ability, and self-reported susceptibility to periodontitis revealed a higher risk of poor OHRQoL. Poor chewing ability, in particular, indicated a five-fold risk of poor OHRQoL. Moreover, high dental anxiety and low SOC are still predictive of poor OHRQoL, also in Model 3. The variables in Model 3 were best at predicting OHRQoL, as the Nagelkerke test statistic was 0.45 compared with 0.10 and 0.28 for the other two models (1 and 2), respectively.

Paper IV

Perceived mental stress increased over time, especially from 1968/69 to 2004/05 and from 1980/81 to 2004/05 for the total group of 38- and 50-year old women (Figure 8). Perceived mental stress was not related to oral health, when expressed as the number of teeth/filled teeth/decayed teeth and alveolar bone loss. Perceived mental stress was not related to education and smoking either.

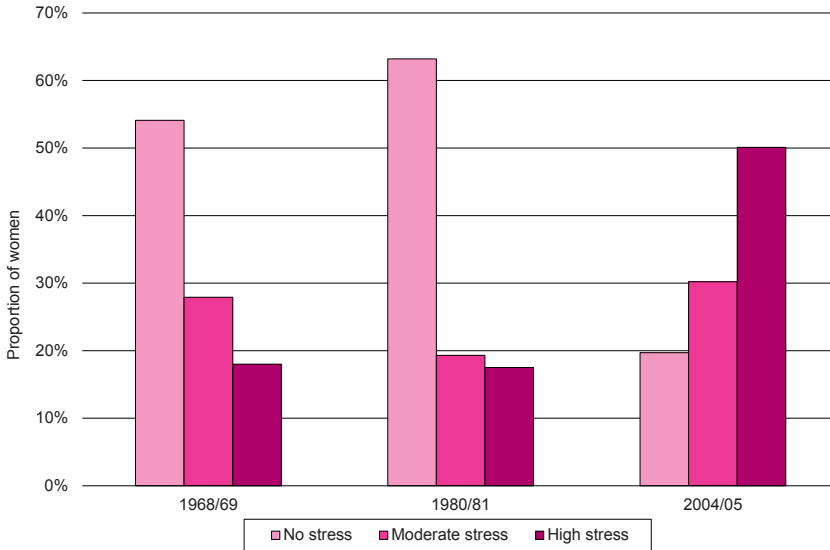


Figure 8. Proportions (%) of the total group of middle-aged women in the different categories of perceived mental stress over time; i.e., in 1968/69, 1980/81 and 2004/05. Significance ($p < 0.05$) in the sub-analyses χ^2 between all three studies.

In 1968/69, smokers had more decayed teeth than non-smokers. In 1968/69 and 1980/81, smokers or those with a low educational level (compared with non-smokers or women with higher educational levels) had fewer filled teeth. In the study in 2004/05, this pattern was reversed. Regarding education, there was a shift towards a smaller proportion of filled teeth over time, especially among highly educated women, from 81 % in 1968/69 to 47 % in 2004/05.

The three models of multivariate analyses showed that higher age (50 vs. 38 years old), smoking and low educational level indicated a greater risk of more alveolar bone loss and fewer remaining teeth. Higher age (50 vs. 38 years old) also indicated a higher risk of more decayed teeth. However, the examination year had a protective effect on oral health, resulting in more remaining teeth, fewer decayed teeth and less periodontal disease, measured as alveolar bone loss, in the later examination year in 2004/05, compared with 1968/69.

DISCUSSION

The purpose of this thesis was to gain knowledge about the development of middle-aged women's oral health from 1968/69 to 2004/05, and to elucidate possible impacts on oral health from different social and psychological factors. Furthermore, it was to analyze secular changes regarding socioeconomic status and perceived mental stress over time.

The results of this thesis showed a dramatic improvement in oral health (especially regarding the remaining number of teeth) during the 36-year span (1968/69-2004/05) for Swedish 38- and 50-year old women in Gothenburg. Socioeconomic status also improved, even though inequalities still remained over time, revealing better oral health among women with higher socioeconomic status. Perceived mental stress also increased remarkably over time among the middle-aged women, but this was not associated with oral health when expressed as the number of teeth, decayed teeth or periodontal disease, measured as alveolar bone loss.

Furthermore, oral health appeared to be influenced by different social and psychological factors. The important health-related psychosocial factors were sense of coherence (SOC) and oral health-related quality of life (OHRQoL), which both had a protective effect on oral health, and dental anxiety that appeared to be a risk factor for poor oral health.

Development over time regarding oral health, socioeconomic status and stress

Over the studied 36-year period, the examination year appeared to have a protective effect on oral health, resulting in more remaining teeth, fewer decayed teeth and less alveolar bone loss in the later examination year in 2004/05, compared with 1968/69. This improvement in oral health over the last decades is supported by other research [91, 117, 118]. For instance, Norderyd et al. also reported the same oral health outcomes (1973-2013), with the addition of fewer filled and endodontically treated teeth in about the same middle-aged groups as in this thesis [118]. Furthermore, almost every fifth 50-year old woman was edentulous in 1968/69, compared with only one woman in 2004/05, showing a substantial decrease in edentulism over time. A decrease in edentulism is also in line with Norderyd et al., among other studies in both Sweden and abroad, for instance, in Brazil, Norway and the US [90-93, 118].

Socioeconomic status also improved over time, with proportionally more women in the higher groups of social class and educational level in 2004/05, compared with 1968/69. Despite this, inequalities in oral health still persisted over time. Cunha-Cruz et al. confirmed this in their study: despite a decrease in edentulism over time, the difference in the prevalence of edentulism remained unchanged between low and high social classes from 1972 to 2001 [90]. Also, Slade et al. describe a decline in edentulism over five decades in the United States; however, there are still more edentulous individuals in low-income households located in areas with more poverty [93].

Fewer remaining teeth were seen among the women in the groups of low social class and low educational level, despite the dramatic increase in the number of remaining teeth for both age groups over time. From 1968/69 to 2004/05, the mean number of teeth in women aged 50 almost doubled, from 14.6 to 27.3, and for women aged 38, the mean number of teeth was 22.2 and 29.0, for the two study years, respectively. This is in accordance with a study from the northern part of Sweden, in which the number of remaining teeth also increased over time (1990-2002), but a relationship between fewer teeth and low educational level was still seen, except in the youngest age group of 35-year olds [117]. This was also seen in this thesis, where the significant relationship between low socioeconomic status and fewer teeth disappeared for the younger group of women (aged 38) in the two latest studies (1992/93 and 2004/05), presumably since they had such a large number of teeth left. For women 50 years old, this association between low socioeconomic status and fewer teeth was valid throughout the total study.

In addition, risk factors for more alveolar bone loss and fewer teeth appeared to be smoking, higher age (50 vs. 38 years old), and low educational level. Previous research revealed similar results, where smoking, together with age, is seen as a risk factor for tooth loss [95] and periodontal disease [89, 96]

Furthermore, educational level produced a gradient effect; the more years at school, the greater the likelihood of more teeth, less alveolar bone loss and better self-reported oral health. Hence, not only are there inequalities in oral health within and between countries, but there is also an oral health gradient, which has been discussed by Marmot and Bell [85]. They point to a decline in the prevalence of tooth loss in the United Kingdom from 1978 to 1998 among adults, but the social gradient with respect to social class persists over time.

Social class, marital status, age group and examination year had a clear impact on the risk of having fewer teeth. Living alone was a risk factor, both for fewer teeth and edentulism, regardless of age. This influence of marital status on the

number of remaining teeth has also been found in other studies, where married women had more remaining teeth [119-121] than women who reported “not married” as their status. However, bivariate analyses showed no association between the number of teeth and marital status for the younger age group of 38-years old. Living alone could be considered to increase vulnerability, due to a disadvantageous economic situation in the household and less social support, which may be related to fewer remaining teeth.

Furthermore, a relationship between periodontal disease and work-related stress, socioeconomic status, marital quality and marital status (e.g., loss of spouse), has been discovered in two studies [70, 71]. Other studies found that women who are satisfied with their marriage have more stable/normal stress levels and can more easily recover physiologically from heavy work, whereas single women who raise their children on their own are more at risk of general health problems (e.g., depression, mobility limitation, poor self-rated health) [122, 123].

This naturally leads us to the issue of perceived mental stress among the middle-aged women in this thesis. An important change over time was seen towards a much greater proportion of middle-aged women reporting high mental stress in the latest examination. However, no relationship was found between perceived mental stress and oral health. Armfield et al. investigated perceived stress and oral health, but like this thesis, found no relationship with objective oral health (e.g. decayed teeth), after they controlled for tooth-brushing and dental visits [124]. However, both Armfield et al. and Finlayson et al. found that self-rated oral health was associated with perceived stress [124, 125]. Other than that, little is mentioned in the scientific literature about perceived mental stress related to oral health and even less when adding the time aspect to these two concepts, even though there is research into the relationship between periodontal disease and stress/psychological factors, as discussed in the introduction [72-74, 126, 127]. Hence, in this thesis, perceived mental stress was not associated with any degree of alveolar bone loss over time. The way the stress question was designed and measured in this thesis may contribute to explain why no associations were found. Additionally, Castro et al. found no association either, between the risk of periodontal disease and psychosocial factors [75].

In 1968/69 and 1980/81, the majority of the middle-aged women reported that they had never experienced any period of stress, where ‘period’ is defined as perceived stress for at least one month. Therefore, women who experienced shorter stress periods than one month are not captured in this study. Hence, this stress question measures more severe stress and long-term periods of stress, which could be seen as a strength in this study, as it captured the severely stressed women. However, in 2004/05, the majority of the women instead

reported that they had experienced several periods of stress (also for at least one month) during the last five years or have lived under constant stress during the last one to five years. As mentioned above, this is a remarkable increase in perceived mental stress over time (Figure 8 in the results section), and the reasons for this may be discussed. Perhaps, the concept of mental stress was not as well known or well defined at the time of the first examination, suggesting that the women in 1968/69 and 1980/81 may have interpreted the issue of stress differently, compared with the women in 2004/05. Furthermore, society may have changed more and more rapidly during the last 24-year period, which, for instance, is supported by the increased presence of work-related stress with high mental demands over time [128].

As society has changed over time, this thesis shows a larger number of highly educated women in 2004/05 than in 1968/69, which is supported in a report by the Swedish National Agency for Higher Education [129]. Consequently, more women work outside the home [130], and since women with higher education are more satisfied with their life situation, this would presumably result in less mental stress [131]. Nevertheless, in this thesis, a larger proportion of the women reported high levels of perceived mental stress in 2004/05 than in 1968/69 and 1980/81. Hence, even though high education is satisfying in itself, it may still entail greater demands, as it involves multiple roles for the women. Women may get more depressed and less satisfied if they perceive their roles to be conflicting; for instance, taking care of aging parents, being a parent or just managing work together with different leisure time activities [132].

Psychosocial aspects on oral health and oral health-related quality of life

Sense of coherence (SOC) was found to be associated with oral health. Irrespective of whether an objective measure of oral health (the number of remaining teeth) or a subjective measure of oral health (self-reported) was used, an increase in SOC scores predicted better oral health. Bernabe et al. and Lindmark et al. also found these associations, between a strong SOC and positive oral health among adults [34-37]. So far, there is no established cut-off to determine the levels of a strong or weak SOC. However, this thesis revealed that an increase by 10 SOC points predicts a 20% and 30% greater likelihood of having more teeth and better perceived oral health, respectively. For the middle-aged women, the cut-off level for the number of teeth was high; 0-25 and 26-32 remaining teeth. The argument for this is that even the loss of a few teeth, given women's generally high oral status today, would indicate affected oral health. In the study by Bernabe from Finland [34], a strong SOC was also associated with

fewer teeth with caries and periodontitis, but such findings were not seen in this thesis.

The salutogenic perspective (measured by SOC) implies a more positive, encouraging approach, with the focus on resources rather than problems and disease/illness. The resources refer to the use of self-preventive and promoting measures to gain and maintain good health [37, 133]. Thus, interventions to increase SOC may be seen as a good health investment, but since SOC develops during childhood and young adulthood (according to Antonovsky [30]), these interventions need to be made during these ages [33]. In dentistry, some have suggested that information about an individual's SOC could be used as a complement to the clinical oral status [37], whereas others discourage this approach, as there are no guidelines for the interpretation of the individual's SOC level [133]. However, there is still a lack of guidelines for the use of SOC in clinical practice.

Furthermore, dental care behavior has been linked to SOC in different studies [32, 33, 134], but dental anxiety in relation to SOC has been sparsely reported on. Dental anxiety is associated with irregular dental care and also with avoiding dental care [56, 135], leading to deteriorating oral health in the long run [59, 61]. In comparison with the previous research just mentioned, the individuals reporting high dental anxiety in this thesis were more likely to have fewer teeth and more approximal caries. On the contrary, Ng and Leung as well as Hakeberg et al. describe fewer filled teeth and filled surfaces among individuals with high dental anxiety, which is contrary to the finding of more filled surfaces in this thesis [57, 59].

Further analyses showed that high dental anxiety was related to poor self-perceived oral health, regardless of age. Individuals with high dental anxiety appeared to have an almost five times higher risk of rating their oral health as poor and a 2,5 times higher risk of having fewer than 25 teeth, compared with individuals with low dental anxiety. Other studies support the theory that high dental anxiety is also correlated with poor self-reported oral health, and not only with worse objective oral health, as discussed above [136, 137]. In the clinic, however, the self-reported measure concerning actual oral status should be interpreted with some caution, as individuals with high dental anxiety tend to over-report deterioration of their own oral health [138].

This study revealed a clear and significant difference in SOC scores between individuals with high and low dental anxiety, indicating that a stronger SOC is predictive of less dental anxiety. Such a relationship was only weak in a recent study by Carlsson et al., where they, unlike this thesis, used a SOC instrument

with three items instead of 13, and a wider age span of investigated individuals (19-96 years) [135]. However, Lindmark et al. showed similar results, although they did not use a validated scaling instrument for dental anxiety [37]. In this thesis, the well-validated Dental Fear Survey was used to measure dental anxiety. Consequently, SOC may play a role in the process of the vicious cycle (described in the introduction), acting as a protective factor against stress. A strong SOC may contribute to facilitating the use of coping strategies for individuals with high dental anxiety. In this way, dentally anxious individuals manage to keep up dental visiting habits and understand what measures to take. This could limit the negative consequences of dental anxiety, which is important in order to maintain oral health.

Regarding oral health-related quality of life (OHRQoL), higher SOC scores indicated a protective effect against poor OHRQoL, whereas high dental anxiety instead appeared to be a risk factor for poor OHRQoL. Several studies from different parts of the world show that high dental anxiety predicts poor OHRQoL [57, 60, 137, 139, 140].

Furthermore, in this thesis, high dental anxiety, as well as irregular dental care, indicated an almost four times higher risk of poor OHRQoL, compared with low dental anxiety and regular dental care behavior. The majority of analyses concern health-related quality of life (HRQoL) and SOC for specific diseases, for instance, rheumatic disorders, heart disease and mental illness, where most studies report that poor HRQoL is associated with lower SOC values [31]. For OHRQoL, however, very few publications report on the relationship between OHRQoL and SOC, and even fewer when dental anxiety is added to these two concepts. The studies of Savolainen et al. and Johansson et al. support the findings described above, of a relationship between poor OHRQoL and weak SOC [38, 139].

However, only Johansson et al. included dental anxiety, which showed an even stronger relationship with OHRQoL than SOC [139]. The finding that high dental anxiety is predictive of poor OHRQoL is also in accordance with the results in this thesis. Additionally, analyses showed that the strong protective effect of SOC against poor OHRQoL was independent of other explanatory factors, such as high dental anxiety, irregular dental care, low income and poor self-reported oral health. Savolainen et al. also found SOC to be a determinant of OHRQoL, independently of oral health, oral health behavior and socioeconomic factors [38]. This fact may point towards SOC having a direct path to the individual's self-perceived well-being and oral health. Thus, SOC could be proposed as a potential clinical measure for predicting oral health.

Concerning self-reported oral health, the most important factors were poor chewing ability, high susceptibility to periodontal disease, and poor subjective oral health, which had a significant impact on poor OHRQoL. However, the bivariate analyses showed additional factors that were predictable of poor OHRQoL, such as problems with dryness of the mouth, dissatisfaction with appearance of oral status and irregular dental care. Stenman et al. discovered the same results regarding all of the above factors, but the most important factors in their study of 70-year old individuals were problems with chewing, dissatisfaction with appearance and the use of dentures [110]. Other studies also support the association between different poor subjective oral health measures and poor OHRQoL [141].

Finally, socioeconomic status appeared to be associated with all of these three psychosocial factors - SOC, dental anxiety and OHRQoL - for the middle-aged women. A gradient effect was revealed; the lower the socioeconomic status, the lower the SOC scores and the higher the dental anxiety. Low socioeconomic status was also related to poor OHRQoL, but the gradient effect here was only seen for income; the lower the income, the higher the risk of poor OHRQoL. Other research reports similar findings [39, 48, 142]. Since socioeconomic factors seem to be important for the development of a strong SOC, good OHRQoL and less dental anxiety, the focus should be on structural interventions in society to gain improvements in oral health.

The majority of the reported studies on the relationship between oral health and all the psychosocial factors previously discussed are cross-sectional, as are the studies in this thesis. Hence, a longitudinal study design must be applied in order to try to elucidate any causal relationships. Whether it is the oral health and reported behavior that cause the impact on SOC, dental anxiety and OHRQoL, or the other way around, should, however, always be considered.

Limitations and strengths

This thesis consists of four studies (Paper I-IV), where the first and last studies were performed over 36 years, and the second and third were performed in 2004/05. All four studies have a cross-sectional design; thus, it is not possible to draw any conclusions about causality.

The limitations of the thesis are that only women were included, only urban women and only women within the narrow age span of 38 and 50 years. Caution must therefore be observed before generalizing the results to other groups and environments.

Furthermore, the participation rate in 1968/69 was about 90 %, but declined over the years. Nevertheless, a participation rate of 60 % was still considered acceptable in the study in 2004/05. Also, the sample size was moderately large in 1992/93. Another limitation could be that the women may have changed their interpretation of the questions in the questionnaires over time. Even though the measurements have been the same during the 36-year period, the variable 'educational level' has changed over time, with different years in mandatory elementary school. To avoid misclassification, the educational level was therefore based on the number of years in the school system. Perceived mental stress as a single question is not yet a validated question, which could be seen as a limitation. However, this single question has been the same ever since 1968/69 and has been asked in the same way throughout the whole study period, and could therefore also be considered a strength. Nevertheless, a change was seen over time, indicating that this single question at least measures something regarding perceived mental stress. A further strength is the ability of this stress question to capture the women with really severe perceived stress.

As mentioned above, this thesis is not a longitudinal study; hence, it is not possible to analyse the development of oral health and other variables in the same women over time. However, this was not the purpose of the thesis. The aim was instead to evaluate the two cohorts/groups of women over time, to elucidate possible changes among middle-aged women during a time period of 36 years. One of the reasons for the start-up of the PSWG was the lack of data/information regarding women, as almost all previous studies concerned men. Accordingly, only women were included in the PSWG, making this a strength as well as a limitation.

Further strengths of this thesis were the random selection of the middle-aged women, the moderate-to-high participation rate, and the repeated performance of the cross-sectional design over the long 36-year period. This is important in order to elucidate secular changes over time concerning oral health, socioeconomic status and stress. Additionally, this allows for generalization of the results, with regard to an urban Swedish population. However, generalization to other cities in other countries similar to the area and the cohorts of women in this thesis may also be possible.

Moreover, the assessments of the variables have been performed in the same way in each study year, and both objective and subjective/self-reported measurements are available for oral health. Another strength was the use of validated measurements concerning sense of coherence, dental anxiety, and oral

health-related quality of life. Additionally, the question concerning self-rated health as a single question has also been validated [13, p.193-216, 14].

Several analyses of the non-participants have been carried out and are accounted for in the section “Materials and methods” in this thesis. Some of the facts mentioned there may influence the result to some extent. Hence, the improvement in oral health may be somewhat overestimated, as the non-participants in 1980/81 and 1992/93 had fewer remaining teeth, and in 2004/05, a larger proportion of them were immigrants. In 2004/05, the non-participants also had lower income; thus, if these subjects had also been examined, the results concerning a weak SOC and poor oral health may have been even clearer and more pronounced. It may also be speculated whether the effects of dental anxiety and sense of coherence have been underestimated, as other studies have shown higher dental anxiety and lower sense of coherence among these subgroups [39, 143].

Implications for future research

Further investigations of these cohorts of middle-aged women could elucidate additional secular changes; for instance, if the inequalities in oral health with regard to socioeconomic status will still persist among the 50-year old women in 2016/17 (refers to the next 12-year period of the Population Study of Women in Gothenburg, Sweden). It may then also be possible to perform a validation of the single question on perceived mental stress.

Since there is growing evidence of a relationship between sense of coherence and oral health, further research can provide ideas for how to use sense of coherence in clinical practice to improve dental care.

Regarding an evaluation of causal relationships, longitudinal studies need to be performed.



CONCLUSIONS

In this thesis, two main aspects were investigated among middle-aged women in Gothenburg, Sweden: **1)** the development over time (1968/69-2004/05) of oral health, socioeconomic status and perceived mental stress, and **2)** the possible influence of psychosocial factors on oral health (in 2004/05), and the relationship between the factors themselves with regard to socioeconomic status.

The main conclusions from this thesis were the following:

1) Oral health improved dramatically over time, with fewer edentulous women and more remaining teeth among the dentate women. The examination year had a protective effect on oral health, with more teeth, fewer decayed teeth and less periodontal disease, measured as alveolar bone loss, in 2004/05 than 1968/69. Socioeconomic status improved over time, even though inequalities still existed, revealing better oral health among women with higher socioeconomic status. Perceived mental stress increased remarkably over time, but there was no relationship with oral health. Moreover, poor oral health was associated with low socioeconomic status, smoking and higher age (50 vs. 38 years old).

2) The psychosocial factors of sense of coherence (SOC), dental anxiety and oral health-related quality of life (OHRQoL), all had an impact on oral health.

* A strong SOC had a protective effect on objective and subjective oral health.

* Dental anxiety was a risk factor for both objective and subjective oral health.

* Good OHRQoL had a protective effect on subjective oral health.

* A strong SOC protects against high dental anxiety, poor OHRQoL and low socioeconomic status.

* High dental anxiety is a risk factor for poor OHRQoL and low socioeconomic status.

* Risk factors for poor OHRQoL: high dental anxiety, irregular dental care and poor self-reported oral health (especially poor chewing ability, high susceptibility to periodontal disease and poor subjective oral health).

* Low socioeconomic status was related to a weak SOC, high dental anxiety and poor OHRQoL. A gradient effect was also revealed: the lower the socioeconomic status, the weaker the SOC and the higher the dental anxiety, and, furthermore, the lower the income, the higher the risk of poor OHRQoL.

ACKNOWLEDGEMENTS

First of all, my deepest gratitude to all the middle-aged women who generously participated in the Population Study of Women in Gothenburg, Sweden.

Special thanks go to:

Professor Magnus Hakeberg, my main supervisor and co-author, who always believed in me and my capability to complete this doctoral program. Thank you for your invaluable encouragement and guidance in the field of research, statistics and dentistry.

Associate Professor Margareta Ahlqwist, my supervisor and co-author, who encouraged and supported me through all these years and made it possible for me to complete this thesis, and for your guidance with the interpretation of radiographs.

Associate Professor Ulla Wide Boman, my supervisor and co-author, who always helped me and encouraged me, and shared her expertise in the field of psychology and research, and also for making it possible for me to complete this thesis.

Professor Cecilia Björkelund, my supervisor and co-author, who helped me with different aspects of the Population Study of Women in Gothenburg, Sweden, with respect to my four scientific papers.

Research coordinator Birgitta Almström, who helped me with magnificent posters, tables, figures and additional organizational administration. Thank you also for being a positive person with a lot of patience.

All my wonderful colleagues and friends in the doctoral program, for interesting discussions, laughter and fun, in our doctoral room (“the compartment of joy and sighs”), and on research trips.

My colleagues and friends at the Department of Behavioral and Community Dentistry, for their joy and support.

My colleagues and friends at the University of Gothenburg for their joy and help with administrative tasks.

My colleagues and friends at the Public Dental Service (Folktandvården), Kortedala, Region Västra Götaland.

Lynn and Erika, for their contribution with recording alveolar bone loss from panoramic radiographs.

My beloved partner Robert, who has been very supportive while I have been finishing this thesis.

Lukas, Jonathan and Linnéa, my wonderful children, who compliment my life and for just being who you are.

My parents Lars and Marianne, who have always helped and supported me in whatever I have been doing, ever since I was a small child, and for still being there for me and my family, and helping out with almost everything.

Britt and Romano, my bonus mother and father-in-law, for always being lovely to my children and myself.

My friends Anne and Lotta, for your support during the pregnancy and birth of Linnéa in the middle of writing this thesis. I could not have done it without you!

All my loving friends outside the university, with whom I am happy to spend time and who make my life fun and full of joy.

Research grants:

The Swedish Research Council.

The Health & Medical Care Committee of the Regional Executive Board, Region Västra Götaland.

TUA grants (The agreement concerning research and education of doctors).

Institute of Odontology, Sahlgrenska Academy, University of Gothenburg.

The Public Dental Service of Region Västra Götaland.

The Gothenburg Dental Society, Sigge Person's and Alice Nyberg's Foundation for Odontological Research.

Kvinnliga Tandläkareklubben (The Association of Female Dentists)

REFERENCES

1. Hallberg L, Högdahl AM, Nilsson L, Rybo G: **Menstrual blood loss--a population study. Variation at different ages and attempts to define normality.** *Acta Obstet Gynecol Scand* 1966, **45**(3):320-351.
2. Hallberg L, Högdahl AM, Svanborg A, Vikrot O: **Individual plasma phospholipids in women. A comparison of menstruating and menopausal 48-year-old women.** *Acta Med Scand* 1967, **181**(2):143-146.
3. Tibblin G: **High blood pressure in men aged 50--a population study of men born in 1913.** *Acta Med Scand Suppl* 1967, **470**:1-84.
4. Bengtsson C, Blohme G, Hallberg L, Hallström T, Isaksson B, Korsan-Bengtzen K, Rybo G, Tibblin E, Tibblin G, Westerberg H: **The study of women in Gothenburg 1968-1969--a population study. General design, purpose and sampling results.** *Acta Med Scand* 1973, **193**(4):311-318.
5. Locker D, Slade G: **Concepts of oral health, disease and the quality of life.** *Measuring oral health and quality of life* 1997:11-24.
6. Engel GL: **The need for a new medical model: a challenge for biomedicine.** *Science* 1977, **196**(4286):129-136.
7. World Health Organization: **Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.**
8. Gift HC, Atchison KA: **Oral health, health, and health-related quality of life.** *Med Care* 1995, **33**(11 Suppl):NS57-77.
9. Petersen PE: **The World Oral Health Report 2003: continuous improvement of oral health in the 21st century--the approach of the WHO Global Oral Health Programme.** *Community Dent Oral Epidemiol* 2003, **31**(s1):3-24.
10. Hugoson A, Koch G, Johansson S, Börjesson A, Lindberg J: **Oral hälsa: sammanställning av konsensuskonferens i Mullsjö 12-14 november 2002:** Gothia; 2003.
11. World Health Organization: **Oral health fact sheet No. 318.** *April* 2012, **7**(03):2012.
12. Brondani MA, MacEntee MI: **Thirty years of portraying oral health through models: what have we accomplished in oral health-related quality of life research?** *Qual Life Res* 2014, **23**(4):1087-1096.
13. Johnson TP: **Handbook of Health Survey Methods [Elektronisk resurs].** Hoboken: Wiley; 2014.

14. Benyamini Y, Leventhal H, Leventhal EA: **Self-rated oral health as an independent predictor of self-rated general health, self-esteem and life satisfaction.** *Soc Sci Med* 2004, **59**(5):1109-1116.
15. Locker D, Allen F: **What do measures of 'oral health-related quality of life' measure?** *Community Dent Oral Epidemiol* 2007, **35**(6):401-411.
16. Anderson KL, Burckhardt CS: **Conceptualization and measurement of quality of life as an outcome variable for health care intervention and research.** *J Adv Nurs* 1999, **29**(2):298-306.
17. Allison PJ, Locker D, Feine JS: **Quality of life: a dynamic construct.** *Soc Sci Med* 1997, **45**(2):221-230.
18. Cohen LK, Jago JD: **Toward the formulation of sociodental indicators.** *Int J Health Serv* 1976, **6**(4):681-698.
19. Gift HC, Atchison KA, Dayton CM: **Conceptualizing oral health and oral health-related quality of life.** *Soc Sci Med* 1997, **44**(5):601-608.
20. Inglehart MR, Bagramian R: **Oral health-related quality of life.** Chicago: Quintessence Publishing Co, Inc.; 2002.
21. Reisine S, Locker D: **Social, psychological, and economic impacts of oral conditions and treatments.** *Disease prevention and oral health promotion: socio-dental sciences in action Copenhagen: Munksgaard and la Fédération Dentaire Internationale* 1995.
22. Atchison KA, Dolan TA: **Development of the Geriatric Oral Health Assessment Index.** *J Dent Educ* 1990, **54**(11):680-687.
23. Slade GD, Spencer AJ: **Development and evaluation of the Oral Health Impact Profile.** *Community Dent Health* 1994, **11**(1):3-11.
24. Slade GD: **Derivation and validation of a short-form oral health impact profile.** *Community Dent Oral Epidemiol* 1997, **25**(4):284-290.
25. Adulyanon S, Sheiham A, Slade G: **Oral impacts on daily performances.** *Measuring oral health and quality of life* 1997:151-160.
26. McGrath C, Bedi R: **An evaluation of a new measure of oral health related quality of life--OHQoL-UK(W).** *Community Dent Health* 2001, **18**(3):138-143.
27. Mostofsky DI, Fortune F: **Behavioral dentistry.** Chichester: Wiley-Blackwell; 2014.
28. Locker D: **Measuring oral health: a conceptual framework.** *Community Dent Health* 1988, **5**(1):3-18.
29. Locker D: **Oral health and quality of life.** *Oral health & preventive dentistry* 2003, **2**:247-253.
30. Antonovsky A: **Unraveling the mystery of health : how people manage stress and stay well.** San Francisco, Calif.: Jossey-Bass; 1987.
31. Eriksson M, Lindström B: **Antonovsky's sense of coherence scale and the relation with health: a systematic review.** *J Epidemiol Community Health* 2006, **60**(5):376-381.
32. Bernabe E, Kivimaki M, Tsakos G, Suominen-Taipale AL, Nordblad A, Savolainen J, Uutela A, Sheiham A, Watt RG: **The relationship**

- among sense of coherence, socio-economic status, and oral health-related behaviours among Finnish dentate adults. *Eur J Oral Sci* 2009, **117**(4):413-418.
33. Savolainen J, Suominen-Taipale A, Uutela A, Aromaa A, Harkanen T, Knuuttila M: **Sense of coherence associates with oral and general health behaviours.** *Community Dent Health* 2009, **26**(4):197-203.
34. Bernabe E, Watt RG, Sheiham A, Suominen-Taipale AL, Uutela A, Vehkalahti MM, Knuuttila M, Kivimaki M, Tsakos G: **Sense of coherence and oral health in dentate adults: findings from the Finnish Health 2000 survey.** *J Clin Periodontol* 2010, **37**(11):981-987.
35. Bernabe E, Watt RG, Sheiham A, Suominen AL, Vehkalahti MM, Nordblad A, Uutela A, Kivimaki M, Tsakos G: **Childhood socioeconomic position, adult sense of coherence and tooth retention.** *Community Dent Oral Epidemiol* 2011.
36. Lindmark U, Hakeberg M, Hugoson A: **Sense of coherence and oral health status in an adult Swedish population.** *Acta Odontol Scand* 2010, **69**(1):12-20.
37. Lindmark U, Hakeberg M, Hugoson A: **Sense of coherence and its relationship with oral health-related behaviour and knowledge of and attitudes towards oral health.** *Community Dent Oral Epidemiol* 2011.
38. Savolainen J, Suominen-Taipale AL, Hausen H, Harju P, Uutela A, Martelin T, Knuuttila M: **Sense of coherence as a determinant of the oral health-related quality of life: a national study in Finnish adults.** *Eur J Oral Sci* 2005, **113**(2):121-127.
39. Lundberg O, Nyström Peck M: **Sense of coherence, social structure and health. Evidence from a population survey in Sweden.** *Eur J Public Health* 1994, **4**:252-257.
40. Smith PM, Breslin FC, Beaton DE: **Questioning the stability of sense of coherence--the impact of socio-economic status and working conditions in the Canadian population.** *Soc Psychiatry Psychiatr Epidemiol* 2003, **38**(9):475-484.
41. Nilsson B, Holmgren L, Stegmayr B, Westman G: **Sense of coherence--stability over time and relation to health, disease, and psychosocial changes in a general population: a longitudinal study.** *Scand J Public Health* 2003, **31**(4):297-304.
42. **Diagnostic and statistical manual of mental disorders : DSM-5.** Arlington, Va.: American Psychiatric Association; 2013.
43. Hofmann SG, Lehman CL, Barlow DH: **How specific are specific phobias?** *J Behav Ther Exp Psychiatry* 1997, **28**(3):233-240.
44. Barlow DH: **Unraveling the mysteries of anxiety and its disorders from the perspective of emotion theory.** *Am Psychol* 2000, **55**(11):1247-1263.
45. Raadal M, Skaret E: **Background description and epidemiology.** *Cognitive behaviour therapy for dental phobia and anxiety* 2013:21-31.

46. Oosterink FM, de Jongh A, Hoogstraten J: **Prevalence of dental fear and phobia relative to other fear and phobia subtypes.** *Eur J Oral Sci* 2009, **117**(2):135-143.
47. Milgrom P, Fiset L, Melnick S, Weinstein P: **The prevalence and practice management consequences of dental fear in a major US city.** *J Am Dent Assoc* 1988, **116**(6):641-647.
48. Armfield JM, Spencer AJ, Stewart JF: **Dental fear in Australia: who's afraid of the dentist?** *Aust Dent J* 2006, **51**(1):78-85.
49. Vassend O: **Anxiety, pain and discomfort associated with dental treatment.** *Behav Res Ther* 1993, **31**(7):659-666.
50. Hakeberg M, Berggren U, Carlsson SG: **Prevalence of dental anxiety in an adult population in a major urban area in Sweden.** *Community Dent Oral Epidemiol* 1992, **20**(2):97-101.
51. Corah NL: **Development of a dental anxiety scale.** *J Dent Res* 1969, **48**(4):596.
52. Kleinknecht RA, Klepac RK, Alexander LD: **Origins and characteristics of fear of dentistry.** *J Am Dent Assoc* 1973, **86**(4):842-848.
53. Abrahamsson KH, Berggren U, Hallberg L, Carlsson SG: **Dental phobic patients' view of dental anxiety and experiences in dental care: a qualitative study.** *Scand J Caring Sci* 2002, **16**(2):188-196.
54. Armfield JM: **Towards a better understanding of dental anxiety and fear: cognitions vs. experiences.** *Eur J Oral Sci* 2010, **118**(3):259-264.
55. Bernson JM, Hallberg LR, Elfström ML, Hakeberg M: **'Making dental care possible: a mutual affair': a grounded theory relating to adult patients with dental fear and regular dental treatment.** *Eur J Oral Sci* 2011, **119**(5):373-380.
56. Berggren U, Meynert G: **Dental fear and avoidance: causes, symptoms, and consequences.** *J Am Dent Assoc* 1984, **109**(2):247-251.
57. Ng SK, Leung WK: **A community study on the relationship of dental anxiety with oral health status and oral health-related quality of life.** *Community Dent Oral Epidemiol* 2008, **36**(4):347-356.
58. Armfield JM, Slade GD, Spencer AJ: **Dental fear and adult oral health in Australia.** *Community Dent Oral Epidemiol* 2009, **37**(3):220-230.
59. Hakeberg M, Berggren U, Gröndahl HG: **A radiographic study of dental health in adult patients with dental anxiety.** *Community Dent Oral Epidemiol* 1993, **21**(1):27-30.
60. Mehrstedt M, John MT, Tonnies S, Micheelis W: **Oral health-related quality of life in patients with dental anxiety.** *Community Dent Oral Epidemiol* 2007, **35**(5):357-363.
61. Locker D: **Psychosocial consequences of dental fear and anxiety.** *Community Dent Oral Epidemiol* 2003, **31**(2):144-151.

62. Wide Boman U, Lundgren J, Berggren U, Carlsson SG: **Psychosocial and dental factors in the maintenance of severe dental fear.** *Swed Dent J* 2010, **34**(3):121-127.
63. Berggren U: **Dental fear and avoidance : a study of etiology, consequences and treatment.** Göteborg; 1984.
64. Schuller AA, Willumsen T, Holst D: **Are there differences in oral health and oral health behavior between individuals with high and low dental fear?** *Community Dent Oral Epidemiol* 2003, **31**(2):116-121.
65. Taylor SE: **Health psychology;** 2015.
66. Lazarus RS, Folkman S: **Stress, appraisal, and coping.** New York: Springer; 1984.
67. Wirtz PH, Ehlert U, Emini L, Rudisuli K, Groessbauer S, Gaab J, Elsenbruch S, von Kanel R: **Anticipatory cognitive stress appraisal and the acute procoagulant stress response in men.** *Psychosom Med* 2006, **68**(6):851-858.
68. Rini CK, Dunkel-Schetter C, Wadhwa PD, Sandman CA: **Psychological adaptation and birth outcomes: the role of personal resources, stress, and sociocultural context in pregnancy.** *Health Psychol* 1999, **18**(4):333-345.
69. Starkman MN, Giordani B, Berent S, Schork MA, Schteingart DE: **Elevated cortisol levels in Cushing's disease are associated with cognitive decrements.** *Psychosom Med* 2001, **63**(6):985-993.
70. Marcenes WS, Sheiham A: **The relationship between work stress and oral health status.** *Soc Sci Med* 1992, **35**(12):1511-1520.
71. Hugoson A, Ljungquist B, Breivik T: **The relationship of some negative events and psychological factors to periodontal disease in an adult Swedish population 50 to 80 years of age.** *J Clin Periodontol* 2002, **29**(3):247-253.
72. Monteiro da Silva AM, Oakley DA, Newman HN, Nohl FS, Lloyd HM: **Psychosocial factors and adult onset rapidly progressive periodontitis.** *J Clin Periodontol* 1996, **23**(8):789-794.
73. Ng SK, Keung Leung W: **A community study on the relationship between stress, coping, affective dispositions and periodontal attachment loss.** *Community Dent Oral Epidemiol* 2006, **34**(4):252-266.
74. Genco RJ, Ho AW, Grossi SG, Dunford RG, Tedesco LA: **Relationship of stress, distress and inadequate coping behaviors to periodontal disease.** *J Periodontol* 1999, **70**(7):711-723.
75. Castro GD, Oppermann RV, Haas AN, Winter R, Alchieri JC: **Association between psychosocial factors and periodontitis: a case-control study.** *J Clin Periodontol* 2006, **33**(2):109-114.
76. Solis AC, Lotufo RF, Pannuti CM, Brunheiro EC, Marques AH, Lotufo-Neto F: **Association of periodontal disease to anxiety and depression symptoms, and psychosocial stress factors.** *J Clin Periodontol* 2004, **31**(8):633-638.

77. Genco RJ, Ho AW, Kopman J, Grossi SG, Dunford RG, Tedesco LA: **Models to evaluate the role of stress in periodontal disease.** *Ann Periodontol* 1998, **3**(1):288-302.
78. Rosania AE, Low KG, McCormick CM, Rosania DA: **Stress, depression, cortisol, and periodontal disease.** *J Periodontol* 2009, **80**(2):260-266.
79. Johannsen A, Rylander G, Söder B, Asberg M: **Dental plaque, gingival inflammation, and elevated levels of interleukin-6 and cortisol in gingival crevicular fluid from women with stress-related depression and exhaustion.** *J Periodontol* 2006, **77**(8):1403-1409.
80. Monteiro da Silva AM, Newman HN, Oakley DA, O'Leary R: **Psychosocial factors, dental plaque levels and smoking in periodontitis patients.** *J Clin Periodontol* 1998, **25**(6):517-523.
81. Johannsen A, Bjurshamar N, Gustafsson A: **The influence of academic stress on gingival inflammation.** *Int J Dent Hyg* 2010, **8**(1):22-27.
82. Johannsen A, Susin C, Gustafsson A: **Smoking and inflammation: evidence for a synergistic role in chronic disease.** *Periodontol 2000* 2014, **64**(1):111-126.
83. Rohleder N: **Acute and chronic stress induced changes in sensitivity of peripheral inflammatory pathways to the signals of multiple stress systems --2011 Curt Richter Award Winner.** *Psychoneuroendocrinology* 2012, **37**(3):307-316.
84. Rostila M, Toivanen S: **Den orättvisa hälsan : om socioekonomiska skillnader i hälsa och livslängd.** Stockholm: Liber; 2012.
85. Marmot M, Bell R: **Social determinants and dental health.** *Adv Dent Res* 2011, **23**(2):201-206.
86. Erikson R, Torssander J: **Social class and cause of death.** *Eur J Public Health* 2008, **18**(5):473-478.
87. Jonsson JO, Mills C: **Cradle to grave : life-course change in modern Sweden.** Durham: Sociologypress; 2001.
88. Charafeddine R, Demarest S, Van der Heyden J, Tafforeau J, Van Oyen H: **Using multiple measures of inequalities to study the time trends in social inequalities in smoking.** *Eur J Public Health* 2013, **23**(4):546-551.
89. Levin L, Kessler-Baruch O: **Cigarette smoking and the alveolar bone around teeth and dental implants.** *N Y State Dent J* 2013, **79**(5):53-59.
90. Cunha-Cruz J, Hujoel PP, Nadanovsky P: **Secular trends in socio-economic disparities in edentulism: USA, 1972-2001.** *J Dent Res* 2007, **86**(2):131-136.
91. Holst D: **Oral health equality during 30 years in Norway.** *Community Dent Oral Epidemiol* 2008, **36**(4):326-334.

92. Celeste RK, Nadanovsky P, Fritzell J: **Trends in socioeconomic disparities in oral health in Brazil and Sweden.** *Community Dent Oral Epidemiol* 2010.
93. Slade GD, Akinkugbe AA, Sanders AE: **Projections of U.S. Edentulism prevalence following 5 decades of decline.** *J Dent Res* 2014, **93**(10):959-965.
94. Watt RG: **From victim blaming to upstream action: tackling the social determinants of oral health inequalities.** *Community Dent Oral Epidemiol* 2007, **35**(1):1-11.
95. Ahlqwist M, Bengtsson C, Hollender L, Lapidus L, Österberg T: **Smoking habits and tooth loss in Swedish women.** *Community Dent Oral Epidemiol* 1989, **17**(3):144-147.
96. Norderyd O, Hugoson A, Grusovin G: **Risk of severe periodontal disease in a Swedish adult population. A longitudinal study.** *J Clin Periodontol* 1999, **26**(9):608-615.
97. Health WCoSDo, Organization WH: **Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health: Commission on Social Determinants of Health Final Report:** World Health Organization; 2008.
98. Daly B: **Essential dental public health.** Oxford: Oxford University Press; 2013.
99. [<http://odontology.gu.se/aktuellt/nyheter/nyheter//institutionen-for-odontologi-trea-i-varlden.cid1288963>]
100. Ahlqwist M, Bengtsson C, Gröndahl HG, Lapidus L: **A 12-year cross-sectional and longitudinal radiographic study of dental restorations in women in Gothenburg, Sweden.** *Community Dent Oral Epidemiol* 1988, **16**(3):175-180.
101. Bengtsson C, Ahlqwist M, Andersson K, Björkelund C, Lissner L, Söderström M: **The Prospective Population Study of Women in Gothenburg, Sweden, 1968-69 to 1992-93. A 24-year follow-up study with special reference to participation, representativeness, and mortality.** *Scand J Prim Health Care* 1997, **15**(4):214-219.
102. Bengtsson C, Gredmark T, Hallberg L, Hällström T, Isaksson B, Lapidus L, Lindquist O, Lindstedt S, Lurie M, Nyström E *et al*: **The population study of women in Gothenburg 1980-81--the third phase of a longitudinal study. Comparison between participants and non-participants.** *Scand J Soc Med* 1989, **17**(2):141-145.
103. Björkelund C, Andersson-Hange D, Andersson K, Bengtsson C, Blomstrand A, Bondyr-Carlsson D, Eiben G, Rödstrom K, Sjöberg A, Sundh V *et al*: **Secular trends in cardiovascular risk factors with a 36-year perspective: observations from 38- and 50-year-olds in the Population Study of Women in Gothenburg.** *Scand J Prim Health Care* 2008, **26**(3):140-146.
104. Ahlqwist M, Bengtsson C, Hakeberg M, Hägglin C: **Dental status of women in a 24-year longitudinal and cross-sectional study.**

- Results from a population study of women in Goteborg.** *Acta Odontol Scand* 1999, **57**(3):162-167.
105. Ahlqwist M: **Women's teeth. A cross-sectional and longitudinal study of women in Gothenburg, Sweden, with special reference to tooth loss and restorations.** *Swed Dent J Suppl* 1989, **62**:1-84.
106. Carlsson G: **Social mobility and class structure.** Lund: Gleerup; 1958.
107. **Consumer Price Index**
[http://www.scb.se/Pages/TableAndChart_35666.aspx]
108. Langius A, Björvell H, Antonovsky A: **The sense of coherence concept and its relation to personality traits in Swedish samples.** *Scand J Caring Sci* 1992, **6**(3):165-171.
109. Milgrom P, Kleinknecht RA, Elliott J, Liu HH, Teo CS: **A cross-cultural cross validation of the Dental Fear Survey in South East Asia.** *Behav Res Ther* 1990, **28**(3):227-233.
110. Stenman U, Ahlqwist M, Björkelund C, Hakeberg M: **Oral health-related quality of life--associations with oral health and conditions in Swedish 70-year-old individuals.** *Gerodontology* 2012, **29**(2):e440-446.
111. Bassiouny MA, Grant AA: **The accuracy of the Schei ruler: a laboratory investigation.** *J Periodontol* 1975, **46**(12):748-752.
112. Lira-Junior R, Freires Ide A, de Oliveira IL, da Silva ES, da Silva S, de Brito RL: **Comparative study between two techniques for alveolar bone loss assessment: A pilot study.** *J Indian Soc Periodontol* 2013, **17**(1):87-90.
113. Molander B, Ahlqwist M, Gröndahl HG, Hollender L: **Agreement between panoramic and intra-oral radiography in the assessment of marginal bone height.** *Dentomaxillofac Radiol* 1991, **20**(3):155-160.
114. Molander B, Ahlqwist M, Gröndahl HG, Hollender L: **Comparison of panoramic and intraoral radiography for the diagnosis of caries and periapical pathology.** *Dentomaxillofac Radiol* 1993, **22**(1):28-32.
115. Ahlqwist M, Halling A, Hollender L: **Rotational panoramic radiography in epidemiological studies of dental health. Comparison between panoramic radiographs and intraoral full mouth surveys.** *Swed Dent J* 1986, **10**(1-2):73-84.
116. Kayser AF, Witter DJ, Spanauf AJ: **Overtreatment with removable partial dentures in shortened dental arches.** *Aust Dent J* 1987, **32**(3):178-182.
117. Pihlgren K, Forsberg H, Sjödin L, Lundgren P, Wanman A: **Changes in tooth mortality between 1990 and 2002 among adults in Vasterbotten County, Sweden: influence of socioeconomic factors, general health, smoking, and dental care habits on tooth mortality.** *Swed Dent J* 2011, **35**(2):77-88.
118. Norderyd O, Koch G, Papias A, Köhler AA, Helkimo AN, Brahm CO, Lindmark U, Lindfors N, Mattsson A, Rolander B *et al*: **Oral health of**

- individuals aged 3-80 years in Jönköping, Sweden during 40 years (1973-2013). *Swed Dent J* 2015, **39**(2):69-86.
119. Åström AN, Ekbäck G, Ordell S, Unell L: **Socio-behavioral predictors of changes in dentition status: a prospective analysis of the 1942 Swedish birth cohort.** *Community Dent Oral Epidemiol* 2010.
120. Thorstensson H, Johansson B: **Why do some people lose teeth across their lifespan whereas others retain a functional dentition into very old age?** *Gerodontology* 2010, **27**(1):19-25.
121. Gulcan F, Ekbäck G, Ordell S, Lie SA, Astrom AN: **Inequality in oral health related to early and later life social conditions: a study of elderly in Norway and Sweden.** *BMC Oral Health* 2015, **15**:20.
122. Saxbe DE, Repetti RL, Nishina A: **Marital satisfaction, recovery from work, and diurnal cortisol among men and women.** *Health Psychol* 2008, **27**(1):15.
123. Hughes ME, Waite LJ: **Health in household context: Living arrangements and health in late middle age.** *J Health Soc Behav* 2002, **43**(1):1.
124. Armfield JM, Mejia GC, Jamieson LM: **Socioeconomic and psychosocial correlates of oral health.** *Int Dent J* 2013, **63**(4):202-209.
125. Finlayson TL, Williams DR, Siefert K, Jackson JS, Nowjack-Raymer R: **Oral health disparities and psychosocial correlates of self-rated oral health in the National Survey of American Life.** *Am J Public Health* 2010, **100** Suppl 1:S246-255.
126. Peruzzo DC, Benatti BB, Ambrosano GM, Nogueira-Filho GR, Sallum EA, Casati MZ, Nociti FH, Jr.: **A systematic review of stress and psychological factors as possible risk factors for periodontal disease.** *J Periodontol* 2007, **78**(8):1491-1504.
127. Stabholz A, Soskolne WA, Shapira L: **Genetic and environmental risk factors for chronic periodontitis and aggressive periodontitis.** *Periodontol 2000* 2010, **53**:138-153.
128. Wiegner L, Hange D, Björkelund C, Ahlborg G, Jr.: **Prevalence of perceived stress and associations to symptoms of exhaustion, depression and anxiety in a working age population seeking primary care - an observational study.** *BMC Fam Pract* 2015, **16**(1):38.
129. **Högskoleverkets rapportserie.** In. Stockholm: Högskoleverket; 1996.
130. Hayghe H: **Rise in mothers' labor force activity includes those with infants.** *Mon Labor Rev* 1986:43-45.
131. Janssen I, Powell LH, Jasielc MS, Matthews KA, Hollenberg SM, Sutton-Tyrrell K, Everson-Rose SA: **Progression of coronary artery calcification in black and white women: do the stresses and rewards of multiple roles matter?** *Ann Behav Med* 2012, **43**(1):39-49.
132. Tiedje LB, Wortman CB, Downey G, Emmons C, Biernat M, Lang E: **Women with multiple roles: Role-compatibility perceptions, satisfaction, and mental health.** *Journal of Marriage and the Family* 1990:63-72.

133. Eriksson M, Lindström B: **Validity of Antonovsky's sense of coherence scale: a systematic review.** *J Epidemiol Community Health* 2005, **59**(6):460-466.
134. Lindmark U: **Oral health and sense of coherence : health behaviours, knowledge, attitudes and clinical status.** Jönköping: School of Health Sciences, Jönköping University; 2010.
135. Carlsson V, Hakeberg M, Wide Boman U: **Associations between dental anxiety, sense of coherence, oral health-related quality of life and health behaviour - a national Swedish cross-sectional survey.** *BMC Oral Health* 2015, **15**(1):100.
136. Meng X, Heft MW, Bradley MM, Lang PJ: **Effect of fear on dental utilization behaviors and oral health outcome.** *Community Dent Oral Epidemiol* 2007, **35**(4):292-301.
137. Pohjola V, Lahti S, Suominen-Taipale L, Hausen H: **Dental fear and subjective oral impacts among adults in Finland.** *Eur J Oral Sci* 2009, **117**(3):268-272.
138. Moore R: **The phenomenon of dental fear: Studies in clinical diagnosis, measurement and treatment.** Department of Child Dental Health and Community Dentistry, Dental Phobia Research and Treatment Center, Royal Dental College; 1991.
139. Johansson V, Axtelius B, Söderfeldt B, Sampogna F, Paulander J, Sondell K: **Multivariate analyses of patient financial systems and oral health-related quality of life.** *Community Dent Oral Epidemiol* 2010, **38**(5):436-444.
140. Vermaire JH, de Jongh A, Aartman IH: **Dental anxiety and quality of life: the effect of dental treatment.** *Community Dent Oral Epidemiol* 2008, **36**(5):409-416.
141. Einarson S, Gerdin EW, Hugoson A: **Oral health-related quality of life and its relationship to self-reported oral discomfort and clinical status.** *Swed Dent J* 2014, **38**(4):169-178.
142. Gabardo MC, Moyses SJ, Moyses ST, Olandoski M, Olinto MT, Pattussi MP: **Social, economic, and behavioral variables associated with oral health-related quality of life among Brazilian adults.** *Ciencia & saude coletiva* 2015, **20**(5):1531-1540.
143. Schuurs AH, Duivenvoorden HJ, Thoden van Velzen SK, Verhage F, Eijkman MA, Makkes PC: **Sociodemographic correlates of dental anxiety.** *Community Dent Oral Epidemiol* 1985, **13**(4):212-215.

Appendix

KASAM (SOC-13)

Här är några frågor som berör skilda områden i livet. Varje fråga har 7 möjliga svar.

Var snäll och markera den siffra som bäst passar in på ditt svar. Siffran 1 eller 7 är svarens yttervärden. Om du instämmer i det som står under 1, så kryssa i ruta 1; om du instämmer i det som står under 7, så kryssa i 7. Om du känner annorlunda, kryssa i den ruta som bäst överensstämmer med din känsla. Ge endast ett svar på varje fråga.

1. Har du en känsla av att du inte riktigt bryr dig om vad som händer runt omkring dig?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mycket sällan eller aldrig						mycket ofta

2. Har det hänt att du blivit överraskad av beteendet hos personer som du trodde du kände väl?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
har aldrig hänt						har ofta hänt

3. Har det hänt att människor som du litade på har gjort dig besviken?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
har aldrig hänt						har ofta hänt

KASAM (SOC-13)

4. Hittills har ditt liv:

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
helt saknat mål och mening						genomgående haft mål och mening

5. Känner du dig orättvist behandlad?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mycket ofta						mycket sällan eller aldrig

6. Har du en känsla av att du befinner dig i en obekant situation och inte vet vad du skall göra?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mycket ofta						mycket sällan eller aldrig

7. Är dina dagliga sysslor en källa till:

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
glädje och djup tillfreds- ställelse						smärta och leda

KASAM (SOC-13)

8. Har du mycket motstridiga känslor och tankar?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mycket ofta						mycket sällan eller aldrig

9. Händer det att du har känslor inom dig som du helst inte vill känna?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mycket ofta						mycket sällan eller aldrig

10. Även en människa med stark självkänsla kan ibland känna sig som en 'olycksfågel'. Hur ofta har du känt det så?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
aldrig						mycket ofta

11. När något har hänt, har du vanligtvis funnit att:

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
du över- eller under- värderade dess betydelse						du såg saken i dess rätta proportion

KASAM (SOC-13)

12. Hur ofta känner du att det inte är någon mening med de saker du gör i ditt dagliga liv?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mycket ofta						mycket sällan eller aldrig

13. Hur ofta har du känslor som du inte är säker på att du kan kontrollera?

1	2	3	4	5	6	7
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mycket ofta						mycket sällan eller aldrig

D F S - Dental Fear Survey

Frågorna i detta formulär berör olika situationer, känslor och reaktioner som kan vara förknippade med tandvård. Ange Dina känslor och reaktioner genom att ringa in den siffra från 1 till 5 som bäst motsvarar Din egen reaktion och uppfattning.

1. Har tandvårdsrädsla någonsin hindrat Dig från att beställa tid hos tandläkare?

1	2	3	4	5
aldrig	någon en- staka gång	några gånger	ofta	nästan varje gång

2. Har tandvårdsrädsla någonsin fått Dig att lämna återbud eller utebli från ett planerat tandläkarbesök?

1	2	3	4	5
aldrig	någon en- staka gång	några gånger	ofta	nästan varje gång

UNDER BEHANDLING HOS TANDLÄKAREN

3. är mina muskler spända.

1	2	3	4	5
inte alls	lite	något	mycket	väldigt mycket

4. andas jag snabbare än normalt.

1	2	3	4	5
inte alls	lite	något	mycket	väldigt mycket

5. svettas jag.

1	2	3	4	5
inte alls	lite	något	mycket	väldigt mycket

6. känner jag mig illamående och som om jag skulle kunna kräkas.

1	2	3	4	5
inte alls	lite	något	mycket	väldigt mycket

7. slår mitt hjärta snabbare.

1	2	3	4	5
inte alls	lite	något	mycket	väldigt mycket

Det följande är en lista på saker och situationer i anslutning till tandläkarbesök som många människor anser vara ångest- eller skräckframkallande.

ANGE HUR STARK RÄDSLÅ, ÅNGEST ELLER OBEHAG VAR OCH EN AV DESSA SITUATIONER ORSAKAR DIG.

Markera efter nedanstående skala från 1 till 5 genom att sätta ett kryss:

1 2 3 4 5
inte alls lite något mycket väldigt mycket

	1	2	3	4	5
8. Att beställa tid	___	___	___	___	___
9. Att komma fram till tandklinik	___	___	___	___	___
10. Att sitta i väntrummet	___	___	___	___	___
11. Att sätta sig i tandläkarstolen	___	___	___	___	___
12. Att känna lukten från tandklinik	___	___	___	___	___
13. Att se tandläkaren komma in i behandlingsrummet	___	___	___	___	___
14. Att se bedövningssprutan	___	___	___	___	___
15. Att känna sticket vid bedövning	___	___	___	___	___
16. Att se borren	___	___	___	___	___
17. Att höra borren	___	___	___	___	___
18. Att känna vibrationerna från borren	___	___	___	___	___
19. Att få tandsten borttagen	___	___	___	___	___
20. Allt som allt, hur rädd är Du för att få tandbehandling	___	___	___	___	___

ENKÄT OM MUNHÄLSA OCH LIVSKVALITÉ (OHRQoL/OHIP-14)

Detta är frågor som syftar till att utvärdera i vilken utsträckning Ditt munhälsotillstånd påverkar Din allmänna livssituation.

Kryssa endast i ett alternativ per fråga.

Exempel:

	aldrig	sällan	ibland	ofta	mycket ofta
Har Du problem med att prata beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	aldrig	sällan	ibland	ofta	mycket ofta
1. Har Du haft svårigheter att uttala något/några ord beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Har Du känt att Dina smakupplevelser har försämrats beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Har Du haft smärta från munhålan?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Har Du upplevt svårigheter att äta någon föda beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Har Du upplevt osäkerhet beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Har Du känt dig stressad beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Har Din diet varit otillfredsställande beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Har Du avbrutit måltider beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Vg vänd

	aldrig	sällan	ibland	ofta	mycket ofta
9. Har Du känt svårigheter att slappna av beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Har Du känt dig något genererad beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Har Du varit irriterad på andra människor beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Har Du haft svårt att genomföra Dina vanliga sysslor beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Har du känt att Din allmänna livssituation varit mindre tillfredsställande beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Har det varit totalt omöjligt för Dig att fungera i det dagliga livet beroende på problem med Dina tänder, munhåla eller proteser?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

