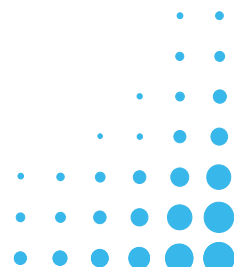





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# ORAL HEALTH IN THE FINNISH ADULT POPULATION

## Health 2000 Survey

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2008





Kansanterveyslaitos  
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# **ORAL HEALTH IN THE FINNISH ADULT POPULATION**

## **Health 2000 Survey**

Liisa Suominen-Taipale, Anne Nordblad, Miira Vehkalahti and Arpo Aromaa, eds.

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## ABSTRACT

A comprehensive Health 2000 Survey was carried out in 2000–2001. The survey was conducted in two nationally representative random population samples and in a third sample that was followed-up for 20 years. The sample that was studied in most detail comprised 8,028 adults aged 30 years or over. The other two populations surveyed were young adults aged 18 to 29 years and subjects who had participated in the Mini-Finland Survey 20 years earlier.

The Health 2000 Survey included an examination of oral health. In subjects aged 30 or over, data on oral health were collected by means of interviews, postal questionnaires, clinical oral examinations (6,335 participants) and panoramic radiography (6,115 participants). This report describes the findings concerning adults aged 30 or over and compares the findings with those obtained in the nationally representative Mini-Finland Survey 20 years earlier.

### *Oral health behaviour*

The coverage of dental care was high: 69% of all adults and 78% of the dentate adults had visited a dentist during the past two years. Most dentate adults visited a dentist regularly. With respect to dental care received, preventive measures were alarmingly infrequent: only 7% reported having received instructions how to brush teeth. Of men, 46%, and of women, 77%, reported brushing their teeth twice a day.

### *Oral health*

Among Finnish adults, periodontal diseases and caries were still common, periodontal diseases being the single most common type of oral diseases. Deepened periodontal pockets (4 mm or more) were found in two out of three dentate subjects; even in the youngest age group (30–34) half of the subjects had deepened pockets. Among men 69% and among women 78% of all teeth with periodontal pockets were diagnosed in 25% of the dentate subjects. Caries occurred in 31% of dentate subjects. Of all decayed teeth, 70% was diagnosed in 10% of all dentate subjects. Among subjects aged 30–64 years, 6% had lost all teeth, among subjects aged 65 years or over 44%. Every other subject aged 75 years or over had a full denture, and one-fifth of those aged over 55 had a partial removable denture. Oral mucosal lesions occurred frequently in persons who wore removable dentures, and many of the dentures were in need of repair. Of the dentate, 60% had radiographically diagnosed, endodontically treated teeth. Vertical infrabony pockets were seen in 10% of the dentate subjects, and apical periodontitis in 27%, most often in endodontically treated teeth.

### *Differences between population groups*

Marked socio-economic variety occurred in adult oral health, and it showed a particularly strong association with level of education. People with the least education had the most oral diseases. They also were the least active in oral self-care and thus constitute a high-risk group for poor oral health. There were marked differences in oral health between the age groups, too. Although the youngest adults aged 30–34 enjoyed the best clinically assessed oral health, many of them reported oral health-related symptoms and problems. In the age group 45–64, the dominant characteristics were high numbers of filled teeth, periodontal diseases and radiographic findings. In the oldest age groups a large percentage was edentulous, and many dentate persons wore removable dentures. Among the middle-aged and the elderly there was considerable need for prosthetic dental treatment. Women had better oral health than men. Substantial gender differences were observed in health behaviour and oral self-care. Women visited a dentist more often and more regularly than men. Women also took better care of their oral hygiene than men. In northern and eastern Finland edentulousness was more frequent and dentate persons had fewer teeth than in other parts of the country.

### *Changes over the past 20 years*

Oral health has improved over the past 20 years. The most prominent improvements were the decrease in the prevalences of edentulousness and caries. There have also been significant increases in the use of dental care services in the past 20 years. In 2000, dental check-ups were more frequent than 20 years ago, particularly among those aged 55 or over. In that age group, one in two dentate adults (65% of women and 49% of men) reported having a dental check-up at least once every two years. Brushing teeth at least twice a day was more frequent than 20 years ago, but even so the frequency of brushing among men in 2000 was lower than the frequency was for women 20 years ago. Adult oral health has improved across the whole population. The most prominent improvements were seen in the youngest age groups and in persons with the most education.

## **PREFACE**

This English summary reports the main results of the adult oral health survey carried out in connection with the Health 2000 Survey. The results have been published earlier in more detail in Finnish (Suominen-Taipale et al. 2004) the current report being an edited and shortened version from the original one. However, results on radiographic findings in the current report are based on partially revised data.

Comparative data for the clinical oral examinations conducted in the Health 2000 Survey were obtained from the Mini-Finland Survey in 1980 (Vehkalahti et al. 1991). The Health 2000 Survey protocol additionally included a radiographic examination. These Finnish surveys are unique particularly due to their exceptionally high participation rates.

The Health 2000 Survey collected a wide set of data using interviews, questionnaires and clinical and radiological examinations. In particular, the digital panoramic radiography obtained makes the Health 2000 Survey more comprehensive than are previous nationally representative studies on oral health elsewhere. The radiographs allowed the identification of treatment needs that cannot be detected in clinical examinations alone. The radiographs also benefited the Health 2000 Survey as a whole in that they served as an important motivating factor for participation.

The purpose of the Health 2000 Survey oral examination was to describe the prevalence and distribution of oral health-related habits, self-reported and observed oral symptoms and oral diseases in the population groups and to assess the associations between various health factors and oral health. Comparisons with the findings from the Mini-Finland Survey provided insights into changes in oral health over the past 20 years.

The design of the research for this survey was largely the responsibility of the oral health research team, which also worked closely with the editors of this volume to compile both the original Finnish report (Suominen-Taipale et al. 2004) and this English version.

The Health 2000 Survey was an extraordinary undertaking and would not have been possible without the excellent cooperation of and funding from many key partners. This research was a joint venture of the Finnish Centre for Pensions, the Social Insurance Institution of Finland, the National Public Health Institute, the Local Government Pensions Institute, the National Research and Development Centre for Welfare and Health, Statistics Finland, the Finnish Institute of Occupational Health, the UKK Institute and many university departments and institutes. In addition, significant funding was obtained from the Academy of Finland, the Finnish Work Environment Fund, the State Occupational Safety and Health Fund, MSD Finland Oy, the Finnish Dental Association and the Finnish Dental Society Apollonia. Plandent Oyj and Planmeca Oy provided assistance and support for the oral examinations.

The collection and compilation of the research material has required inputs from many individuals, from Statistics Finland interview staff and the National Public Health Institute field teams as well as their dentists and dental nurses, systems analysts, statistical experts, research secretaries and many others. Local government authorities in the municipalities involved in the survey and experts representing the manufacturers of the radiographic equipment also contributed to fieldwork.

*Helsinki 1.10.2008*

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# 1. MATERIAL AND METHODS

*Liisa Suominen-Taipale and Miira Vehkalahti*

Edited and revised from: Suominen-Taipale L, Vehkalahti M. Aineisto ja menetelmät. In: Suominen-Taipale L, Nordblad A, Vehkalahti M, Aromaa A, eds. Suomalaisten aikuisten suunterveys. Terveys 2000 -tutkimus (in Finnish with English abstract). KTL, B16/2004, Helsinki 2004, pp. 14–23. [http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)

## 1.1. General description of the survey

The aim of the Health 2000 Survey was to obtain up-to-date information on the most important public health problems in Finland, on their causes and treatment as well as on the population's functional capacity and working capacity. The data for the survey were collected in interviews with almost 10,000 and in comprehensive health examinations of 8,000 people.

The two-stage stratified cluster sampling design was planned by Statistics Finland. The main sample comprised adults aged 30 years and over living in mainland Finland. In addition, there were two other datasets. A sample of 1894 persons aged 18 to 29 years was drawn using the sampling design described above. Their study protocol was a modified and condensed version of the one used for those aged 30 or over. In order to obtain follow-up data, seven municipalities were selected where all survivors from the Mini-Finland Survey in 1978 to 1980 were invited to take part in the study (n=1,260 aged 50 years or over).

The first stage in the survey of the population aged 30 or over was the health interview by Statistics Finland interviewers. Taking an average 90 minutes to complete, the interviews were usually conducted at the subjects' home, sometimes at their workplace or an institution prior the health examination.

The health examinations were carried out at 80 field examination sites, usually at local health centres (Figure 1.1.1.). The examinations were conducted between September 2000 and March 2001 by five field examination teams involving nurses, dentists and physicians.

On completion of the interview the subject was handed the first questionnaire. In addition, the survey included three further questionnaires. One of them was completed during the health examination, two were returned by mail after it.

Subjects who were unable to attend the health examination were given the option of taking the examination at home or at the institution where they lived. In this case the health interview, the health examination and two questionnaires were all

abridged versions. If this was not possible, data were collected by phone and a post questionnaire.

The sampling designs, materials and methods of data collection for all components of the Health 2000 Survey are described in the basic survey report (Aromaa and Koskinen 2004) and in its methods report (Heistaro 2008). Detailed information on the Health 2000 Survey is available at the KTL website <http://www.terveys2000.fi/indexe.html> including the questionnaires and forms used in data collection.

## **1.2. Oral health examination**

The Health 2000 Survey collected three datasets to examine oral health and related factors in the Finnish adult population. The main dataset comprised the population aged 30 or over; the other two were the interview and questionnaire survey among young adults (aged 18–29) and the Mini-Finland follow-up study. This report describes the findings for the main dataset only, i.e. the population aged 30 or over.

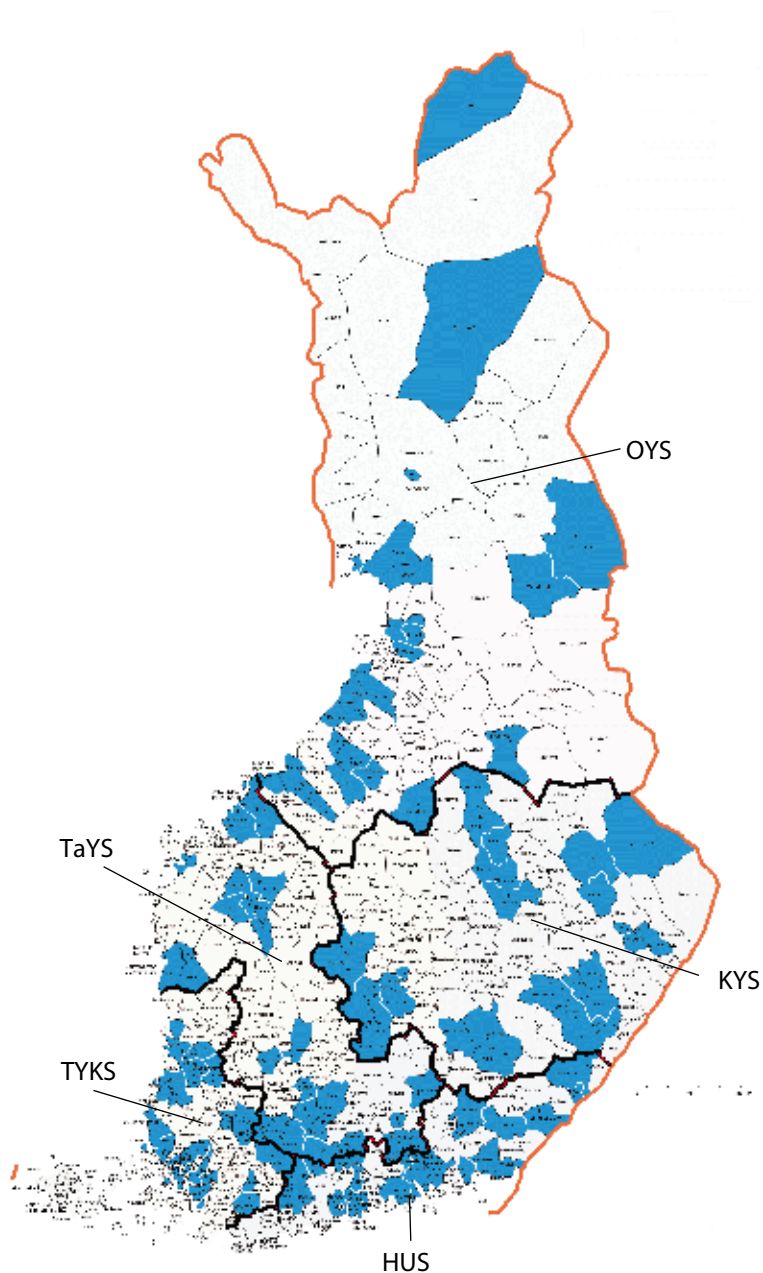
The clinical and radiological oral examinations were conducted as part of the health examination. The clinical and radiological oral examination took on average 15 minutes; the health examination as a whole lasted around four hours. Repeat and parallel measurements were taken regularly in order to ascertain the quality and reliability of the measurements. These issues are discussed in more detail in Chapter 2 of this report as well as in the Health 2000 methods report (Heistaro 2008).

Elements of the oral health study were included in the health interview and in two questionnaires, one of which was completed before the clinical oral examination and the other after it. Subjects examined at home took short versions of both the oral examination and interviews. Questions concerning oral health were also included in the telephone interview and the post questionnaire.

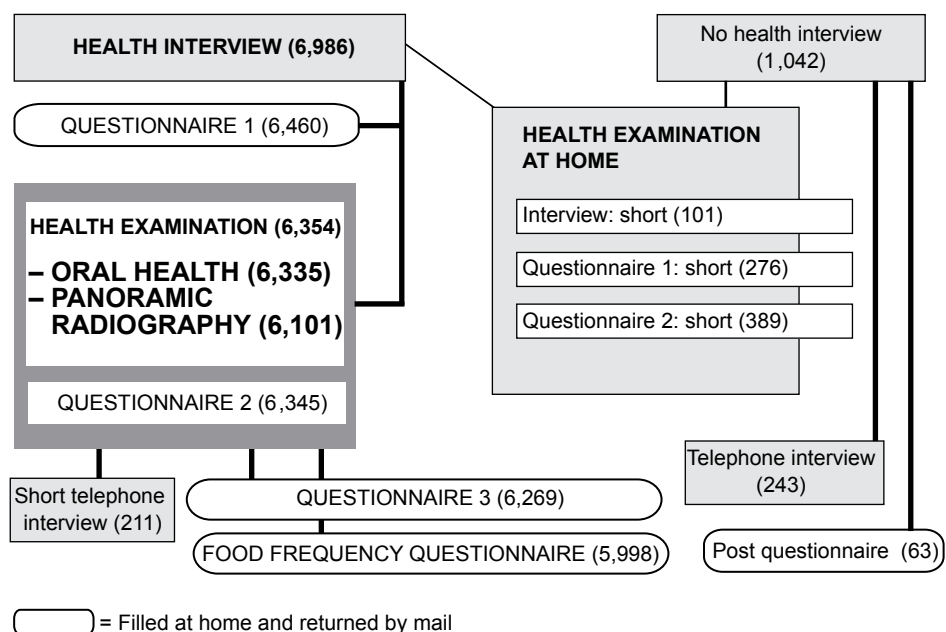
## **1.3. Material**

The total sample size for the population aged 30 or over was 8,028 persons, but number of participants varied at different parts of the survey (Figure 1.3.1.). Clinical oral examinations were conducted on 6,335 persons, panoramic radiographs (OPTG) were obtained from 6,115 persons (Table 1.3.1.). The populations from which the results are drawn are indicated separately in each chapter of this report.

**Figure 1.1.1. Health 2000 Survey sites and university hospital districts: Helsinki (HUS), Turku (TYKS), Tampere (TaYS), Kuopio (KYS) and Oulu (OYS).**



**Figure 1.3.1. Participants at various parts of the Health 2000 Survey.**



**Table 1.3.1. Number of participants in clinical and radiological oral examinations by age and gender.**

	All	Age group						
		30–44	45–54	55–64	65–74	75+	30–64	65+
<b>Clinical examination</b>	<b>6,335</b>	<b>2,148</b>	<b>1,624</b>	<b>1,103</b>	<b>804</b>	<b>656</b>	<b>4,875</b>	<b>1,460</b>
Men	2,869	1,015	787	512	345	210	2,314	555
Women	3,466	1,133	837	591	459	446	2,561	905
<b>Radiological examination<sup>1</sup></b>	<b>6,101</b>	<b>2,058</b>	<b>1,602</b>	<b>1,081</b>	<b>792</b>	<b>568</b>	<b>4,740</b>	<b>1,360</b>
Men	2,802	998	774	500	341	189	2,271	530
Women	3,299	1,060	828	581	451	379	2,469	830

<sup>1</sup> Fourteen radiographs of unacceptable quality were excluded. The radiological material thus comprised 6,101 images, or 96% of the total number of participants in the clinical oral examination

## **1.4. Methods**

### **Health interview**

In the health interview the subjects were asked to indicate whether they had teeth and/or removable dentures. Based on the responses obtained, those subjects were classified as edentulous who said they had no remaining teeth; and those were classified as dentate who reported that they did have one or more teeth. The classification was applied from the interview stage as certain questions were formulated differently for dentate and edentulous subjects.

In the health interview the subjects were also asked to assess their own current state of oral health and possible need for dental care, and to report any pains and problems they had experienced related to their teeth or dentures during the past 12 months. Furthermore, the interview included items on oral self-care, the use of dental care services, the content and costs of dental care as well as attitudes towards dental care.

The questions were predominantly the same as in earlier Finnish population studies on oral health (Nyman 1975, Nyman 1990, Vehkalahti et al. 1991, Arinen et al. 1998), but the present survey included more detailed questions on oral hygiene, dental care received and attitudes to dental care. Some of the new items were based on the UK population survey (Kelly et al. 2000) some were specially developed for this survey.

### **Questionnaires**

The use of sweets and snacks was measured with a self-administered Questionnaire 1 before the health examination. Oral health-related problems were assessed with the 14-item Oral Health Impact Profile (OHIP-14; Slade and Spencer 1994), and included in a Questionnaire 3 that was handed out to the subjects after the health examination and returned by mail.

### **Clinical and radiological examinations**

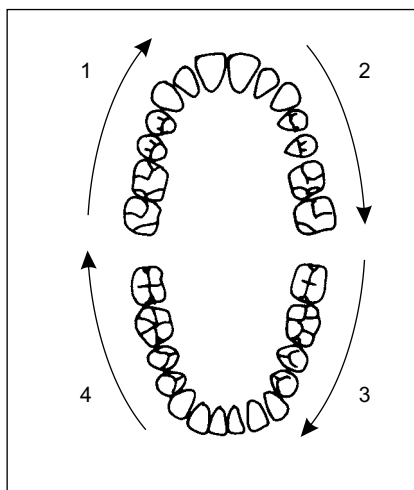
The methods used in the clinical oral examination were based on those used earlier in the Mini-Finland Survey (Vehkalahti et al. 1991) and other population surveys (Todd and Lader 1991, Zain 1995, Drury et al. 1996, Kelly et al. 2000), on WHO guidelines (WHO 1980, WHO 1997) as well as on methods described in textbooks or applied in standard clinical practice. For reasons of comparability with the Mini-Finland Survey, all methods of measurement used in the Health 2000 Survey were either identical or expanded versions of those earlier methods.

The clinical and radiological oral examinations were conducted by a dentist with the assistance of a dental nurse (or oral hygienist). The clinical examinations were carried out by the dentist and the dictated observations were entered into a computer by the nurse, who also took the panoramic radiograph. If the examining dentist or the dentist's deputy was prevented from being present, the nurse took the radiograph and conducted part of the clinical examination; this happened in one case only. During software freeze-ups the clinical data were recorded on preprinted forms. These data were keyed into the database as soon as possible after the software problem was resolved.

Clinical examinations were carried out with a portable dental treatment unit (Dentronic Mini-Dent®, Planmeca Oy) including a built-in compressor, saliva suction and a high-powered suction motor. In addition, the team had the use of a portable patient chair, fibre optic light (Novar), fibre optic head lamp (Tekmala Oy) and a letter scale. Examinations were conducted using a dental mirror and a WHO periodontal probe. A specific guidebook, prepared by the research design team for oral health, contained detailed instructions on the various stages of the clinical oral and radiological examination, measurement determinations and computer entries.

The subjects were first asked: “Do you have any health condition for which your doctor or dentist has said you require antibiotic protection in connection with dental care?” Periodontal pockets were not measured in subjects who answered in the affirmative.

The clinical examination always followed the same order. First, maximum mouth opening was measured and the subject's jaw joints and masticatory muscles were palpitated. Information was recorded on the presence of dentures, which were checked for condition, fit and cleanliness. After the examination of mucous membranes and the measurement of occlusion, the patient chair was adjusted to reclined position. Next, intraoral images were taken of any mucous membrane findings (still frame with video camera); any spaces in dental arches and dental plaque; and the status of teeth and periodontium were examined and recorded.



**Figure 1.4.1. Sequence of examining dentition.**



The subjects' teeth and periodontium were always examined in the same order, starting from the most posterior tooth in the upper right quadrant and ending with the most posterior tooth in the lower left quadrant (see Figure 1.4.1). The clinical examination was concluded with a panoramic radiograph. Subjects with removable dentures were finally asked about dentures' age, how subjects used them, and whether any repairs had been made or were needed.

At the end of the clinical examination, a digital panoramic radiograph was taken of each subject by the dental nurse. The image was reviewed by the dentist and the main findings preliminarily interpreted on screen. Assessments of image quality and sensitivity and more detailed analyses of the findings were conducted later on by four specialists in oral radiology.

### **Feedback to subjects**

On completion of the oral examination, the participants were given a written summary of the examination findings, a hard copy of the radiograph and where necessary a referral to a hospital outpatient clinic of oral and maxillofacial diseases or a recommendation to seek other dental treatment.

### **Abbreviated protocol for primary drop-outs**

The home health examination included a short oral examination in which the public health nurse counted the number of teeth and recorded data on removable dentures. If the subject had not taken the health interview, a short interview was conducted at home. That interview included items on perceived oral health and need for dental care, self-care and the use of dental care services. Wherever possible, data on subjects who did not attend the health examinations and health interviews were collected via telephone interviews and a post-questionnaire. Both of these included items on the use of oral health care services.

### **Classifications**

Edentulousness is a significant distinguishing factor in describing oral health and the use of oral health care services. Parts of the results were therefore presented according to this classification. The subjects were classified as dentate or edentulous on the basis of their responses to the health interview, or on the basis of the observed number of teeth in the clinical or radiological oral examination.

Age, geographical area, level of education, and income have been factors related to oral health and use of services in Finland (Vehkalahti et al. 1991) and therefore also used in describing the present findings.

Age groups were formed with a view to the specific subject covered in each chapter, “Working age” referring here to the age group 30–64, “Elderly” being those aged 65 or over.

Geographical area was described by reference to subject’s place of residence in one of the country’s five university hospital districts: Helsinki (HUS), Turku (TYKS), Tampere (TaYS), Kuopio (KYS) and Oulu (OYS). The districts are shown in Figure 1.1.1. (Page 11).

Level of education was determined on the basis of data on initial and vocational education collected in the health interview. The subjects were classified into three groups: basic, intermediate and higher education (Aromaa and Koskinen 2004). Subjects who had completed no more than a vocational training course or on-the-job training but who had not matriculated, were classified in the category of “basic education”. “Intermediate education” comprised all those persons who had completed secondary or post-secondary vocational training, apprenticeship training, qualifications based on competence tests, or specialist vocational qualifications regardless of their initial education; this category also comprised those who had completed a vocational training course or on-the-job training and who had matriculated. Finally, persons with post-secondary vocational qualifications, a polytechnic degree or a university degree were placed in the category of “higher education”.

The subjects were divided into three equal-sized income categories based on disposable income per household consumption unit. The calculations were based on household monthly income as obtained from the respondents in the health interview. Income figures describing each subject were obtained by using the OECD’s consumption unit concept (OECD 1982), in which the first adult is assigned the value 1.0, other adults 0.7 and each child under 18 the value 0.5.

## Statistical methods

The sampling design used in the Health 2000 Survey places some special requirements on the statistical methods and software used. These requirements arise from the need in the analyses to take into account the dependence between observation units drawn from the same clusters as a result of the stratification and clustering methods used. For greater generalizability and comparability of the results, weighting coefficients calculated by Statistics Finland were used to correct effects of over-sampling people aged 80 years or older and non-response. The results are presented in the form of means or prevalence statistics using Sudaan procedures that take into account the sampling design used (SUDAAN 2001).

## 2. QUALITY ASSURANCE

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Various steps were taken to assure the quality of the examination procedures and the measurements taken in the field stage of the Health 2000 Survey. Clinical measurements were based on validated methods used in previous population surveys. Criteria for the measurements were designed with a specific view to clarity and unambiguity. Each of the five field teams had at hand the protocol with written and illustrated definitions for the measurements.

### Pilots

The piloting of the clinical examination, the use of electronic forms, induction training to field examination staff and the detailed guidelines provided for the field teams all supported the maintenance of the quality assurance of examinations and measurements. All field examination staff received a two-week training (Heistaro 2008). It included a two-day course on the use of the digital panoramic radiography equipment, software and the printout of images was provided by the manufacturer (Plandent Oyj). The clinical oral examination in the first pilot for the Health 2000 Survey involved 34 persons, in the second pilot 93 persons.

### Training and quality assurance in the field

The training courses ended with a dry run in real field circumstances. The field stage of the Health 2000 Survey was completed by five field teams (each including an oral health team with one dentist and one dental nurse or hygienist) that worked simultaneously. It was imperative therefore that each oral health team had access to the same kind and same quality of research facilities so that all the measurements could be taken in exactly the same way. Furthermore, it was important that the equipment used could be easily transported and installed because the survey was carried out in 80 different locations (see Figure 1.1.1., page 11). The removal of equipment presented a particularly formidable challenge because of time pressures when moving from one location to the next.

During the field stage the quality assurance included repeat and parallel measurements, spread evenly throughout the field stage of the survey. A reference dentist took the parallel measurements at several visits to each field team. In total,

parallel measurements were conducted in 269 subjects. The repeat measurements were carried out by random selection throughout the field stage, in total for 111 subjects.

### **Quality assurance for interpretation of radiographs**

At the training stage all four specialist dentists recruited to interpret the radiographs examined 50 images from subjects who took part in the second pilot test. They were blind to one another's interpretations. On this basis the diagnostic criteria were further specified and detailed written guidelines were prepared for the analyses. While the radiographs taken in the field were read, samples of them were submitted for re-reading at an interval of approximately 30 radiographs. In all, repeat assessments were made for 327 radiographs.

### **Assessing agreement of measurements**

Agreement of measurements was described in terms of percentages of concordant determinations, as kappa values and by means of the McNemar tests for skewness (Fleiss 1981). Comparisons of the parallel measurements conducted by the field dentists and the reference dentist on the 269 participants are shown in Table 2.1. For radiographs taken at the training stage, comparisons of the parallel readings appear in Table 2.2.

According to these data it seems that quality assurance of the clinical measurements was highly successful. Overall, the level of agreement between the measurements was very high, particularly so for the determination of the condition of teeth. Levels of agreement were somewhat lower for areas that are more difficult to measure, which is consistent with earlier experiences from similar surveys.

**Table 2.1. Quality of clinical measurements: comparison of the parallel measurements by five field dentists and the reference dentist in real field circumstances (n=269).**

Measurement	Same <sup>1</sup> %	Kappa	95% CI <sup>2</sup>	Skewness <sup>3</sup>
Restricted vertical mouth opening	95	0.56	0.34–0.77	ns
During mouth opening				
• clicking	84	0.44	0.35–0.52	+++
• grating sounds	91	0.21	0.13–0.29	ns
Pain in jaw joints	92	0.26	0.19–0.34	+++
Pain in masticatory muscles	95	0.47	0.41–0.53	+++
Removable dentures				
• need of repair	51	0.33	0.21–0.45	–
• hygiene of the denture	62	0.45	0.31–0.58	– –
Mucosal lesions related to removable dentures				
• ulceration	86	0.22	0.07–0.37	ns
• hyperplasia	82	0.22	0.36–0.59	ns
• stomatitis	82	0.47	0.36–0.62	ns
Mucous membrane findings	87	0.47	0.32–0.62	ns
Cross and scissors bite	87	0.63	0.53–0.74	ns
Overjet	93	0.72	0.63–0.82	ns
Overbite	79	0.55	0.45–0.65	+++
Angle's classification	77	0.57	0.48–0.66	ns
Dental plaque	58	0.36	0.31–0.41	– – –
Spaces in dental arches	99	0.97	0.94–1.00	+
Dental status by tooth	93	0.87	0.84–0.89	+++
Periodontal pockets by tooth	77	0.41	0.38–0.43	– – –
Gingival bleeding by sextant	66	0.36	0.31–0.41	– – –

<sup>1</sup> Percentage of unanimous diagnoses

<sup>2</sup> Kappa value 95% confidence interval

<sup>3</sup> McNemar skewness test: ns = no skewness, + and – signs: field dentist reported more (+) or less (-) findings than reference dentist; number of signs indicates intensity of skewness (low, moderate or high)

**Table 2.2. Interpretation of panoramic radiographs (n=50) at training stage: comparison of three specialist dentists' interpretations with the reference dentist's interpretations.**

Measurements	Same <sup>1</sup> %	Kappa	95% CI <sup>2</sup>	Skewness <sup>3</sup>
Readability of the radiograph	98	0.96	0.80–1.12	ns
Atrophy				
• upper jaw	90	0.41	0.30–0.52	ns
• lower jaw	91	0.38	0.27–0.49	ns
Periapical lesions				
• yes / no	90	0.79	0.63–0.95	ns
• number of lesions per subject	78	0.58	0.47–0.68	---
Horizontal bone loss	61	0.27	0.15–0.40	+++
Vertical infrabony pockets, extending to				
• middle third of root	77	-0.04	-0.12–0.05	+++
• apical region	94	0.72	0.56–0.88	ns
Condylar changes	82	0.30	0.23–0.37	+++
Root fillings				
• presence	98	0.96	0.80–1.12	ns
• incompleteness	65	0.31	0.19–0.43	+++
• inadequate	69	0.16	0.04–0.28	+++
• overfilled	97	0.69	0.55–0.83	++

<sup>1</sup> Percentage of unanimous diagnoses

<sup>2</sup> Kappa value 95% confidence interval

<sup>3</sup> McNemar skewness test: ns = no skewness, + and – signs: field dentist reported more (+) or less (-) findings than reference dentist; number of signs indicates intensity of skewness (low, moderate or high)

### 3. SUBJECTIVE ORAL HEALTH

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#### Methods

Self-rated oral health and need for dental care were assessed in the interviews conducted before the health examinations or at the home health examinations (n=7,087). The subjects were asked how they rated the condition of their teeth and oral health: good, fairly good, average, fairly poor or poor. They were also asked whether they had had toothache during the past 12 months or other problems related to their teeth or dentures. Furthermore, the interviews included an item on perceived need for oral health care: “Do you think you are currently in need of oral health care?” The presence of chewing problems was assessed in the interview preceding the health examination (n=6,986) where the subjects were asked whether they were capable of chewing hard or tough food (such as rye bread) without difficulty, with difficulty or not at all.

The oral health related problems were measured with the 14-item Oral Health Impact Profile (OHIP-14) (Slade and Spencer 1994). The OHIP-14 contains 14 questions about the frequency of adverse impacts caused by oral conditions. The past month was used as the reference period. OHIP-14 was included as part of the questionnaire administered in connection with the health examination, and it was returned by the subjects by mail (Questionnaire 3). The purpose was to establish how often the subjects had experienced physical, psychological, functional or social problems related to oral health during the past month.

The subject’s dental status was based on the determination in the home interview: those persons were classified as dentate who reported having natural teeth. The number of dentate subjects among those interviewed was 5,656, among those responding to the questionnaire and OHIP the figure was 4,947.

# Results

## Self-rated oral health

Of all, 64% described the condition of their teeth and their oral health as good or fairly good, 23% as average and 12% as fairly poor or poor. Edentulous subjects in the age group 45-54 had the best assessment of the condition of their teeth and oral health. Excepting edentulous subjects, women rated their oral health as better than men, and young subjects had a better assessment of their oral health than older subjects. Among men aged 75 or over, 20% rated the condition of their teeth and their oral health as poor or fairly poor, among women in the youngest age group the proportion was no more than 6% (Appendix Table 3.1).

Subjects with a basic education rated the condition of their teeth and their oral health as poorer than did those with an intermediate or higher education. The differences between educational levels were greatest in the age group 30–44; among those with a basic education 17% rated the condition of their teeth and their oral health as poor or fairly poor, among those with a higher education less than 3%.

## Toothache or other problems related to teeth or dentures

Of all subjects, 32% indicated that they had suffered from toothache or other problems related to their teeth or dentures during the past 12 months. Toothache and problems were reported most frequently in the youngest age group, and edentulous subjects reported problems less often than dentate subjects. There were only minor differences between men and women (Table 3.1). Women with a higher education reported toothache or problems most often (Appendix Table 3.2).

**Table 3.1. Percentage of subjects who reported having had toothache or other problems related to teeth or dentures during the past 12 months by age and dental status (n=7,087).**

	Age group					
	All	30–44	45–54	55–64	65–74	75+
<b>All</b>	<b>32</b>	<b>36</b>	<b>32</b>	<b>33</b>	<b>28</b>	<b>22</b>
Men	30	32	29	33	27	25
Women	33	39	34	32	28	20
<b>Dentate</b>	<b>34</b>	<b>36</b>	<b>32</b>	<b>34</b>	<b>33</b>	<b>26</b>
Men	32	32	31	34	33	28
Women	35	40	34	34	33	25
<b>Edentulous</b>	<b>22</b>	<b>35</b>	<b>23</b>	<b>26</b>	<b>20</b>	<b>20</b>
Men	22	--	17	27	16	24
Women	23	--	31	26	22	18

-- less than 50 observations



## Perceived need for oral health care

Young people thought they needed oral health care more often than older people did. Of the subjects in the age group 30–44, 54% said at the time of the survey that they needed oral health care, in the age group over 75 the percentage was 28%. Fewer edentulous subjects than dentate subjects felt they were in need of care (Table 3.2.).

**Table 3.2. Percentage of subjects reporting need for oral health care at the time of the survey (n=7,087).**

	Age group					
	All	30–44	45–54	55–64	65–74	75+
<b>All</b>	<b>47</b>	<b>54</b>	<b>50</b>	<b>46</b>	<b>38</b>	<b>28</b>
Men	49	57	50	45	40	29
Women	45	51	51	46	38	27
<b>Dentate</b>	<b>51</b>	<b>54</b>	<b>52</b>	<b>48</b>	<b>46</b>	<b>35</b>
Men	52	57	52	47	49	33
Women	50	52	53	49	44	36
<b>Edentulous</b>	<b>28</b>	<b>43</b>	<b>29</b>	<b>35</b>	<b>20</b>	<b>23</b>
Men	28	--	29	33	22	26
Women	29	--	29	36	29	22

-- less than 50 observations

## Ability to chew hard or tough food

Most of the respondents (86%) reported that they could chew hard or tough food without difficulty, 11% managed with difficulty and 3% could not manage at all. Chewing problems were reported most particularly by edentulous subjects: 24% of them said that chewing was difficult and 10% that they were unable to chew hard or tough food at all. The corresponding figures for dentate subjects were 8% and 2%, respectively.

## Oral health related problems (OHIP)

### *Number of problems*

Of the subjects, 36% had experienced some problem occasionally or more often during the past month; 69% of them reported 1–3 problems. All 14 OHIP items through to total inability to function were mentioned by 26 (0.4%) subjects. A

larger percentage of edentulous (52%) than dentate (33%) subjects reported having had at least one perceived problem.

### **Perceived problems**

The most common problems reported by the subjects among the OHIP items were painful aches (17%), difficulties with eating (19%) and a sense of self-consciousness (18%) (Appendix Table 3.3.). Subjects in the oldest age groups (75 or over) reported problems with eating, including a worsened sense of taste, unsatisfactory diet and interrupted meals, more often than younger respondents. Furthermore, 9% of subjects aged 75 or over had had difficulties with everyday activities as a result of problems with their teeth, mouth or dentures, whereas in the age group 30–44 the corresponding figure was no more than 2%.

There were only minor differences between men and women in the number and distribution of reported problems. However women had felt more tense, experienced more embarrassment and been less satisfied in their life than men. A much larger proportion of edentulous than dentate subjects had experienced problems (Appendix Table 3.3.).

## 4. ORAL SELF-CARE

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[http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)

### Methods

Data on oral self-care were collected both in the health interview and in the self-administered questionnaire (Questionnaire 1). Some of the questions were asked of all subjects, some were only presented to those who reported having natural teeth (n=5,595) or who had removable dentures (n=2,414). The questions were largely the same as in earlier population surveys (Vehkalahti et al. 1991, Arinen et al. 1998), but closer attention was given in this survey to oral hygiene habits, the consumption of sweet snacks and the use of fluoride-containing products. Some of the new questions were based on the UK population survey (Kelly et al. 2000), some were specially developed for this survey.

In the health interview the respondents were asked, “How often do you brush your teeth?” The five preset response options were: a) more often than twice a day, b) twice a day, c) once a day, d) less often than once a day and e) never. A corresponding question about the cleaning of dentures was asked of all subjects who wore removable dentures.

Dentate subjects were also asked: “When cleaning your mouth and teeth, how often do you use a) an ordinary toothbrush, b) an electric toothbrush, c) dental floss or interdental brush, d) toothpicks, e) fluoride toothpaste and f) fluoride pills or solution?” The same response options were presented for all items: daily, weekly, less often and never.

The questionnaire item on the use of sweet snacks was as follows: “How often do you usually consume the products listed below?” The products listed were coffee or tea with sugar, other sweet beverages, chocolate or filled biscuits, toffee or liquorice or dried fruit, and lozenges or chewing gum, both with and without xylitol. The response options for all these items were: a) 3 or more times a day, b) once or twice a day, c) 2–5 times a week, d) less often and e) never.

Data on oral hygiene were collected as part of the clinical oral examination. Cleanliness of teeth was measured if the subjects had teeth available for the measurement of plaque (n=5,295), cleanliness of dentures was measured if the subjects wore removable dentures (n=2,414).

Cleanliness of the teeth was assessed by measuring the amount of dental plaque on three teeth, on one surface for each tooth: the buccal surface of the most posterior tooth in the upper right quadrant, the lingual surface of the most posterior tooth in the lower left quadrant and the labial surface of the lower canine tooth. The amount of visible plaque was recorded using a scale modified from the index developed by Silness and Løe (1964): 1) no plaque, 2) plaque on gingival margin only and 3) plaque elsewhere. The worst finding indicated each subject's overall oral cleanliness. To determine the cleanliness of dentures, they were removed but not rinsed. Cleanliness was assessed separately for dentures in the upper and lower jaw. Dentures were deemed to be clean if no plaque or calculus were present.

## Results

### Cleaning teeth and dentures

Among dentate subjects 61% said they brushed their teeth twice a day (women 76%, men 45%). These figures include those reporting that they brushed their teeth more often than twice a day: 9% overall, 13% of women and 5% of men. Of all, 8% said they brushed their teeth less often than once a day, 2% of women and 14% of men. Age group differences were marginal.

People with a basic education brushed their teeth less frequently than others, those with a high level of education more frequently than others. This difference was more pronounced in men than in women (Table 4.1., Appendix Table 4.1.). Among men with a basic education tooth brushing less often than once a day was six times that reported in men with the highest level of education.

Among women, 71% said they cleaned their dentures at least twice a day, 26% once a day and 3% less frequently. The corresponding figures for men were 47%, 44% and 9%. Subjects with a basic education cleaned their dentures less often than others, and in all age groups cleaning frequencies were lower in men than women (Appendix Table 4.2.).

The use of an electric toothbrush was equally common among women and men: some 14% reported using it daily. The figure for subjects with the higher education was 20%, for those with a basic education 9%. Dental floss and interdental brushes were used quite rarely: daily use was reported by 14% of women and 5% of men.

**Table 4.1. Distribution (%) of tooth brushing frequency by level of education and gender in subjects who according to the interview data were dentate (n=5,595).**

Level of education	Frequency of teeth brushing	All	Men	Women
All	Twice a day	61	45	76
	Once a day	31	41	22
	Less often	8	14	2
Basic	Twice a day	50	33	66
	Once a day	37	44	30
	Less often	13	23	4
Intermediate	Twice a day	58	44	78
	Once a day	34	44	21
	Less often	8	12	1
Higher	Twice a day	76	64	85
	Once a day	22	32	15
	Less often	2	4	<1

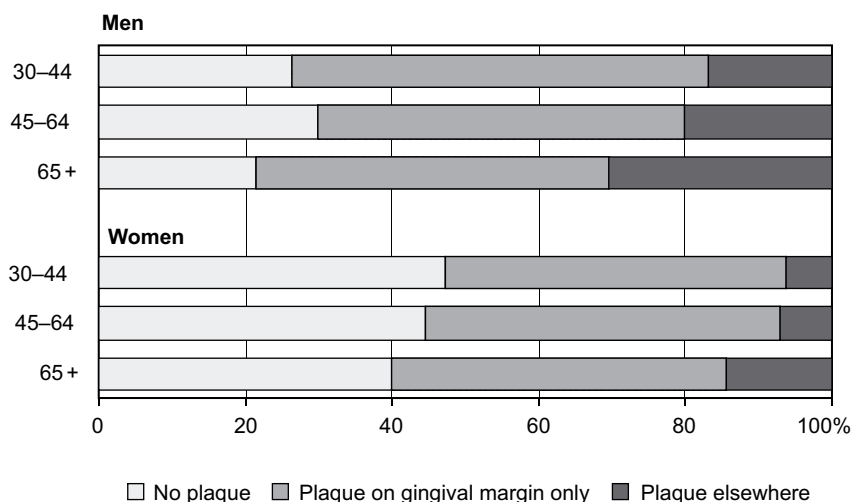
### **Use of fluoride**

Among dentate subjects 89% said they used fluoride toothpaste on a daily basis. The figure was higher among women (93%) than men (84%) and higher in the age group 30–44 than in the age group 65 or over (93% vs. 76%). The use of other fluoride products (pills and solutions) was rare: only 1% of men and 2% of women reported using any of such fluoride products daily.

### **Cleanliness of mouth**

One in three dentate persons had clean teeth (no plaque), one-half had gingival plaque only. Women had much cleaner teeth than men (Figure 4.1.). Of the dentate women, 45% had no plaque, 47% had plaque only gingivally and 8% elsewhere; the corresponding figures for men were 27%, 53% and 20%. In the age group 65 or over, 40% of women and 22% of men had clean teeth, 46–48% had gingival plaque only, but 14% of women and 30% of men had plaque elsewhere. There were no marked differences between educational categories. Clean dentures were observed in 43% of all denture wearers, more often in women than in men (47% vs. 37%).

**Figure 4.1. Distribution (%) of dentate men and women by age group according to plaque findings (n = 5,295). Plaque was measured from three teeth, the worst finding indicating each subject's situation.**



### Use of sweets and snacks

Among dentate subjects the three most popular types of sweets and snacks among the eight various types listed were: (1) coffee or tea with sugar, (2) sugar-containing fruit juices and squash, fizzy drinks or cocoa and (3) chewing gum with xylitol (Table 4.2.). Of men, 54% and of women, 34% reported drinking coffee or tea with sugar every day. Daily consumption of coffee or tea with sugar was most common in the age group 65 or over.

Among men 23% and among women 13% said they drank juices, fizzy drinks or cocoa every day, among subjects aged 30–44 the proportion was clearly higher (28%) than in other age groups (Table 4.2.). The higher the subject's level of education was, the lower was the consumption of sugar.

The percentage of heavy consumers of coffee or tea with sugar (twice or more a day) among dentate men was 30% and among dentate women 14%; on the other hand 27% of men and 46% of women never had coffee or tea with sugar (Appendix Table 4.3.). The percentage of heavy consumers was highest in the youngest age groups: 37% of men and 15% of women.

Xylitol was most typically consumed in the form of chewing gum: 11% of dentate men and 19% of women said they used xylitol chewing gum daily. The youngest subjects used xylitol more often than others: the percentage of daily users among

men aged 30–44 was 16% and among women 27%, but in the age group 65 or over the figures were only 2% and 5%. The higher the level of subject’s education was, the greater was the percentage of xylitol chewing gum users. (Appendix Table 4.3.)

Other sweet snacks such as toffee, liquorice and chocolate or lozenges, sweets and chewing gum not containing xylitol, were used less frequently: the highest percentage of daily users was 3% of dentate subjects (Table 4.2.).

**Table 4.2. Daily use of sweets and snacks by age group, as percentages of dentate men (M) and women (W) responding to questionnaire (n=5,288).**

Type of sweet snack	Age group							
	All		30–44		45–64		65+	
	M	W	M	W	M	W	M	W
Coffee or tea with sugar	54	34	55	30	51	32	61	53
Sugar-containing juices and squash, fizzy drinks and cocoa	23	13	28	16	19	11	19	14
Chewing gum with xylitol	11	19	16	27	9	17	2	5
Lozenges and sweets with xylitol	7	7	7	8	7	7	7	6
Lozenges and sweets without xylitol	3	3	3	2	3	3	6	2
Chocolate or filled biscuits	3	3	2	4	3	3	5	3
Toffee or liquorice, or e.g. raisins	2	1	1	<1	2	1	3	2
Chewing gum without xylitol	1	<1	1	1	1	<1	1	<1

## 5. UTILISATION OF SERVICES

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[http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)

### Methods

Data on utilisation of oral health care services were based on the interview conducted prior the health examination or during the home health examination. Responses to the oral health care questions were received from 7,087 subjects. Original questions, their response options, target groups and new variables formed are shown in Table 5.1. The subjects who said they had visited a dentist during the past five years were asked about the treatment they had received during their most recent treatment course. Type of treatment measures were asked one at a time, and only if they were relevant in view of self-reported dental status (being dentate or not or having removable dentures).

### Results

#### Use of services

Of all, 55% reported having made oral health care visits during the past 12 months. The percentage for edentulous participants was 21%, for dentate participants 62%.

The use of oral health care services was most common among the dentate subjects aged 55–64: 76% of women and 63% of men reported having made a visit during the past 12 months. In all age groups the percentages were higher for women than for men (Table 5.2.). The higher the level of education or income, the higher the percentage of subjects in all age groups reporting use of oral health care services during the past 12 months (Table 5.3.). Subjects living in eastern or northern Finland reported such use less frequently than did those living in other parts of the country.



**Table 5.1. Questions on the use of oral health care services.**

Question	Response options	Target group	New variables formed
1. During the past 12 months, how many times have you visited (each option a – e was asked in turn)	a) a public sector dentist? b) a private dentist? c) some other dentist (Student Health Service, Defence Forces, university, hospital, etc.)? d) a dental technician? e) received some other dental treatment	All	<b>Oral health care visit:</b> response options a–e. <b>Visit to a dentist:</b> response options a–c. Annual number of visits to a <b>dentist</b> is the sum of response options a–c. Treatment place/sector was defined according to number of visits under response options a–e.
2. When did you last visit a <b>dentist</b> ?	1) 1 to 2 years ago 2) 3 to 5 years ago 3) over 5 years ago 4) I have never visited a dentist	Only to subjects who reported not to have visited a <b>dentist</b> during the past 12 months (Number of visits 0 under response options a – c in question 1).	Time since most recent visit to a <b>dentist</b> : 1) during the past 12 months (question 1 response options a–c) 2) 1–2 years ago ( question 2 response option 1) 3) 3–5 years ago (question 2 response option 2) 4) >5 years ago (question 2 response options 3 and 4)
3. Do you usually go to see a <b>dentist</b> :	1) regularly for a check-up 2) only when you have toothache or some other trouble 3) never?	Only to subjects who reported to be dentate.	
4. Do you visit a <b>dentist</b> for a check-up:	1) about once a year 2) about every other year 3) less frequently?	Only to subjects who reported to have regular check-ups (Option 1 in question 3).	
5. Do you have your dentures checked (regardless of whether you are aware of any faults):	1) about once a year 2) at least once every five years 3) less frequently 4) never?	Only to edentulous subjects who reported to wear full dentures.	
6. How did you make your most recent dental appointment:	1) did you make the appointment yourself 2) did you receive an invitation 3) did you make the appointment during your previous treatment course 4) did you go to the dentist's without making an appointment?	Only to subjects who had visited a <b>dentist</b> during the past five years.	

**Table 5.2. Percentage of subjects (n=7,087) reporting an oral health care visit during the past 12 months by age, gender and dental status.**

	Total	Age group				
		30–44	45–54	55–64	65–74	75+
<b>Total</b>	<b>55</b>	<b>59</b>	<b>59</b>	<b>60</b>	<b>44</b>	<b>32</b>
Men	51	52	51	57	43	36
Women	58	66	67	63	45	30
<b>Dentate</b>	<b>62</b>	<b>59</b>	<b>61</b>	<b>70</b>	<b>61</b>	<b>59</b>
Men	56	53	54	63	57	62
Women	68	67	68	76	65	57
<b>Edentulous</b>	<b>21</b>	<b>54</b>	<b>35</b>	<b>19</b>	<b>18</b>	<b>14</b>
Men	21	--	25	27	16	13
Women	22	--	47	14	19	14

-- less than 50 participants

**Table 5.3. Percentage of dentate subjects (n=5,656) reporting an oral health care visit during the past 12 months by level of education and income category.**

	All	Age group				
		30–44	45–54	55–64	65–74	75+
<b>Total</b>	<b>62</b>	<b>59</b>	<b>61</b>	<b>70</b>	<b>61</b>	<b>59</b>
<b>Level of education</b>						
Basic	57	55	54	65	54	51
Intermediate	60	56	60	69	66	70
Higher	69	64	71	80	86	80
<b>Income category</b>						
Lowest	56	58	52	61	56	51
Middle	60	57	58	71	60	64
Highest	68	63	6	74	78	87

### Use of services by treatment sector

Of the subjects, 34% had visited a private dentist and 18% a public sector dentist. Three per cent had visited some other dentist. There were no gender differences in the frequency of visiting different treatment sectors (Table 5.4.). In the age group 30–44, 30% had visited a private dentist and 29% a public sector dentist. The corresponding figures for the age group 45–64 years were 43% and 14%, and for the age group 65 or over 24% and 11%. Only 1% reported visits to both a public sector dentist and a private sector dentist during the past 12 months.

**Table 5.4. Percentage of subjects (n=7,087) reporting an oral health care visit during the past 12 months by dental status, gender and treatment sector. Subjects were allowed to report visits to several places.**

Treatment sector	Total	Dentate	Edentulous
<b>Total</b>	<b>55</b>	<b>62</b>	<b>21</b>
Men	51	56	21
Women	58	68	22
<b>Public sector</b>	<b>18</b>	<b>21</b>	<b>6</b>
Men	17	19	6
Women	20	23	6
<b>Private</b>	<b>34</b>	<b>40</b>	<b>9</b>
Men	32	35	10
Women	36	44	9
<b>Other <sup>1</sup></b>	<b>8</b>	<b>7</b>	<b>10</b>
Men	7	6	9
Women	8	8	10

<sup>1</sup> Finnish Student Health Service, Defence Forces, university, hospital, dental technician, dental hygienist or dental nurse

### **Time since the most recent visit to a dentist**

Of all, 52% reported a visit to a dentist during the past 12 months, 69% had visited a dentist during the past two years, and 19% said they had not visited a dentist in at least five years (Table 5.5).

Among dentate subjects, 78% reported visits to a dentist during the past two years, 12% during 3–5 years and 10% over 5 years ago. The corresponding figures for edentulous subjects were 25%, 12% and 63% (Table 5.5).

Among dentate subjects the highest percentage of visitors during the past 12 months occurred in the age group 55–64 years, among edentulous subjects in the age group 30–44 years (Table 5.5). The percentage of women who reported a visit to a dentist during the past 12 months was higher than the corresponding percentage for men (Appendix Table 5.1).

**Table 5.5. Distribution (%) of subjects by time since the most recent reported visit to a dentist in all (n=7,087), dentate (n=5,656) and edentulous (n=1,420) subjects by age group.**

	Age group					
	All	30–44	45–54	55–64	65–74	75+
<b>All</b>						
≤ 1 year	52	58	57	57	39	29
1–2 years	17	22	16	12	14	11
3–5 years	12	14	13	11	11	10
> 5 years	19	7	14	20	36	49
<b>Dentate</b>						
≤ 1 year	60	58	60	67	59	57
1–2 years	18	21	17	13	18	15
3–5 years	12	14	13	9	10	11
> 5 years	10	7	10	11	13	17
<b>Edentulous</b>						
≤ 1 year	15	53	29	14	8	10
1–2 years	10	27	8	9	8	9
3–5 years	12	9	15	16	13	10
> 5 years	63	10	48	62	72	71

### **Habitual reason for seeing a dentist**

Among dentate subjects, 41% said they only went to see a dentist when they had pain or other dental problems. Regular check-ups were more common in women (64%) than men (50%) as well as in people of working age as compared to subjects aged 65 or over (Table 5.6). This habit was related to level of education: 46% of subjects with the basic education, 57% of those with an intermediate and 69% of those with the higher level educated said they went to see a dentist for regular check-ups (Table 5.7).

**Table 5.6. Distribution (%) of dentate subjects by habitual reason for seeing a dentist, age group and gender (n=5,656)**

	Age group					
	All	30–44	45–54	55–64	65–74	75+
<b>All</b>						
Regular check-ups	57	60	58	59	50	44
Only when having pain or other problems	41	39	40	39	46	47
Never	2	1	2	2	4	9
<b>Men</b>						
Regular check-ups	50	51	50	53	45	43
Only when having pain or other problems	46	47	46	43	50	47
Never	4	2	4	4	5	10
<b>Women</b>						
Regular check-ups	64	68	65	66	54	44
Only when having pain or other problems	35	31	34	34	43	48
Never	1	<1	1	0	3	8

**Table 5.7. Distribution (%) of dentate subjects by habitual reason for seeing a dentist, level of education and gender (n=5,643)**

	Level of education			
	All	Basic	Intermediate	Higher
<b>All</b>				
Regular check-ups	57	46	57	69
Only when having pain or other problems	41	50	41	30
Never	2	4	2	1
<b>Men</b>				
Regular check-ups	50	40	51	63
Only when having pain or other problems	46	54	47	36
Never	4	6	2	1
<b>Women</b>				
Regular check-ups	64	52	66	74
Only when having pain or other problems	35	46	33	26
Never	1	2	1	<1

Among those who reported having regular check-ups, 74% said they do so annually, 22% once every two years and 4% less frequently. The percentage of annual check-up visitors was lowest (65%) in the age group 30–44. No differences were seen between men and women.

Among the participants who wore full dentures, 6% said they have their dentures checked once a year, 25% once every five years, 38% less frequently and 32% never. With the exception of the age group 75 or over, women reported having their dentures checked more often than did the men. The percentage of those who said they never have their dentures checked was highest among those aged 74 or over.

**Number of visits to a dentist**

Of those who had visited a dentist during the past 12 months 46% reported one visit, and 21% reported two visits. The mean number of visits was 2.6 (Table 5.8.). There were only minor differences between age groups, between men and women, and between the public and the private sector. The mean number of annual visits in the whole population is shown in Appendix Table 5.2.

**Table 5.8. Mean number of visits among subjects who reported having visited a dentist during the past 12 months (n=3,602).**

	All	30–44	Age group		
			45–54	55–64	65+
<b>All<sup>1</sup></b>	<b>2.6</b>	<b>2.6</b>	<b>2.7</b>	<b>2.5</b>	<b>2.5</b>
Men	2.5	2.5	2.5	2.6	2.6
Women	2.6	2.6	2.8	2.4	2.5
<b>Public sector<sup>2</sup></b>	<b>2.4</b>	<b>2.5</b>	<b>2.3</b>	<b>2.3</b>	<b>2.3</b>
Men	2.5	2.6	2.4	2.6	2.2
Women	2.3	2.5	2.2	2.1	2.3
<b>Private sector<sup>3</sup></b>	<b>2.5</b>	<b>2.4</b>	<b>2.7</b>	<b>2.5</b>	<b>2.4</b>
Men	2.5	2.4	2.4	2.5	2.6
Women	2.6	2.5	2.9	2.5	2.3

<sup>1</sup> at least one visit to a public sector, private or some other dentist (n=3,602)

<sup>2</sup> at least one visit to a public sector dentist (n=1,294)

<sup>3</sup> at least one visit to a private dentist (n=2,344)

## Treatments received during the most recent treatment course

The most common treatments reported by dentate subjects (Table 5.9.) were clinical oral examination (88%), scaling and polishing (70%), and filling therapy (66%). Treatment courses rarely included guidance on tooth brushing (7%), use of fluoride (3%) or dietary counselling (2%). Men and women had received very similar treatments, but some variation was observed between age groups. Those in the youngest age group (30–44 years) reported radiographs (40%) and fluoride varnishes (47%) more often than did those in older age groups (27% and 23%, respectively).

**Table 5.9. Reported treatments (%) received during the most recent treatment course in dentate subjects (n=5,595) by age group.**

Treatment	Age group			
	All	30–44	45–64	65+
<b>Examinations and diagnostics</b>				
Clinical oral examination	88	90	88	87
Radiography	35	40	32	27
<b>Preventive care</b>				
Instructions how to brush teeth	7	7	7	6
Dietary counselling	2	3	2	1
Advice on use of fluorides	3	4	2	1
Polishing or scaling	70	69	71	68
Fluoride varnish or other fluoride treatment	37	47	32	23
<b>Restorative care</b>				
Filling therapy	66	66	67	59
Root canal treatment	13	13	14	12
<b>Surgery</b>				
Extraction of a tooth or a radix	13	11	12	17
Intraoral surgery	2	2	2	3
Treatment of temporomandibular disorders	1	1	1	0
<b>Prosthetic care</b>				
Preparation or repair of a crown or a bridge	6	5	7	9
Preparation or repair of removable dentures	5	1	6	13

Appendix Table 5.3. shows the treatments reported by dentate subjects by service sector. The following treatments were reported more often by private dentists' patients as compared to public sector patients: oral examinations (91% vs. 85%), polishing and scaling (75% vs. 61%), and fluoride varnishes or some other fluoride treatments (39% vs. 33%). Public sector patients, on the other hand, reported the following treatments more often than patients in the private sector: radiographs (39% vs. 33%), extractions (13% vs. 9%) and root canal treatments (15% vs. 12%).

**Making appointment for the most recent treatment course**

Of those, who had visited a dentist during the past five years, 72% had made their appointment by themselves, 25% received an invitation from their dentist, 2% had made the appointment during their previous treatment course, and 1% had gone to the surgery without making an appointment. Recalls were more common among those who during the past year had visited a private practitioner than among public sector visitors (Table 5.10.).

*Table 5.10. Making an appointment (%) for the most recent treatment course according to reported visits to a public sector (n=1,294) or a private sector dentist (n=2,344) during the past five years.*

	Reported visit to a dentist during the past five years	
	Private sector	Public sector
Appointment made by patient	59	76
Invitation from dentist	39	20
Appointment made during previous treatment course	2	2
No appointment	<1	2



## 6. EDENTULOUSNESS AND NUMBER OF TEETH

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[http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)

### Methods

Number of teeth was determined during the clinical oral examination or at the home health examination. In the clinical examination, a dentist determined the presence, condition and location of each tooth. At the home health examination, only number of teeth was determined by a nurse. All teeth were counted to obtain number of teeth, including third molars, deciduous teeth and tooth remnants that were visible or tactile in the mouth during the clinical examination or at home visit. If both deciduous and the respective permanent tooth were present, the latter one was counted. Tooth remnants were not counted in the number of teeth when determining the prevalence of subjects with a minimum of 20 functional teeth. This classification was feasible only for those who attended the clinical examination.

### Results

#### Edentulousness

Of the subjects, 15% examined were edentulous. Among subjects aged 30–64, 6% had lost all their teeth, among older people aged 65 or over the figure was 44%. The prevalence of edentulousness in the WHO reference age group 35–44 years was 0.4%.

In the youngest age groups (those under 55) total tooth loss was equally rare in women and men, but in older age groups edentulousness was clearly more common among women than men. A lower level of education and a lower income were both related to edentulousness (Table 6.1). The proportion of edentulous subjects was highest in women aged 65 or over and who had no more than basic education. In the age band 30–54 years, a greater proportion of men than women with no more than basic education were edentulous (Appendix Table 6.1). There were marked geographical differences: the proportion of edentulous subjects, particularly women, was greatest in Oulu university hospital district representing northern Finland than in other parts of the country (Table 6.1., Appendix Table 6.1).

**Table 6.1. Percentage of edentulous subjects by age group, gender, level of education, university hospital district and income category (n=6,719).**

	Age group							
	All	30–44	45–54	55–64	65–74	75+	30–64	65+
<b>All</b>	<b>15</b>	<b>&lt;1</b>	<b>6</b>	<b>16</b>	<b>36</b>	<b>56</b>	<b>6</b>	<b>44</b>
Men	11	<1	6	13	32	50	5	38
Women	17	<1	6	18	39	60	6	48
<b>Level of education</b>								
Basic	29	1	11	24	42	64	14	51
Intermediate	7	<1	5	13	26	43	4	32
Higher	2	<0	2	2	6	21	1	12
<b>University hospital district</b>								
Helsinki	10	0	3	7	27	49	3	37
Turku	12	0	7	11	27	47	5	36
Tampere	16	0	8	19	36	58	7	45
Kuopio	18	0	6	21	41	59	7	48
Oulu	22	1	8	29	55	78	10	64
<b>Income category</b>								
Lowest	25	0	7	26	44	63	9	52
Middle	13	0	7	18	35	46	6	39
Highest	4	0	5	6	12	23	3	15

**Table 6.2. Mean number of teeth in dentate subjects by age group, gender, level of education, university hospital district and income category (n=5,611).**

	Age group							
	All	30–44	45–54	55–64	65–74	75+	30–64	65+
<b>All</b>	<b>22.8</b>	<b>27.6</b>	<b>22.5</b>	<b>19.1</b>	<b>16.3</b>	<b>13.4</b>	<b>24.1</b>	<b>15.4</b>
Men	23.0	27.8	22.3	18.9	16.7	13.1	24.1	15.7
Women	22.6	27.3	22.8	19.2	16.0	13.6	24.1	15.2
<b>Level of education</b>								
Basic	18.3	25.4	19.5	16.7	14.7	12.2	20.0	13.9
Intermediate	24.2	27.7	22.7	19.8	18.3	12.8	24.9	16.7
Higher	26.1	28.2	25.6	22.5	20.7	18.5	26.6	19.9
<b>University hospital district</b>								
Helsinki	24.0	28.1	24.1	20.8	18.1	14.0	25.2	16.6
Turku	23.0	27.5	23.8	18.7	18.2	14.5	24.2	16.9
Tampere	22.9	27.5	22.8	19.3	16.6	13.5	24.3	15.7
Kuopio	21.5	27.3	20.8	17.1	14.0	11.3	23.1	13.2
Oulu	21.1	26.5	19.1	16.6	11.1	12.2	22.2	11.3
<b>Income category</b>								
Lowest	20.5	26.8	20.6	15.8	14.2	11.7	22.7	13.3
Middle	23.0	27.7	22.0	18.1	17.2	15.1	24.2	16.6
Highest	24.7	28.0	23.9	21.8	19.6	18.1	25.0	19.2

## **Number of teeth**

The mean number of teeth in all participants, including edentulous subjects, was almost 20. Dentate persons had an average of 23 teeth; the figure was nearly the same for both men and women. A higher level of education and higher income were related to a higher number of teeth. Subjects living in Kuopio and Oulu university hospital districts representing eastern and northern Finland had the lowest number of teeth (Table 6.2.).

Number of teeth was almost the same for men and women. This was seen in each age group regardless of educational level. In older age groups women living in Kuopio and ulu university hospital districts representing eastern or northern Finland had fewer teeth than the men had.

Overall, 14% of dentate subjects were dentate in one jaw only. Subjects were far more likely to have lost all teeth in the upper than the lower jaw. In subjects who had teeth in one jaw only, the mean number of teeth in the lower jaw was 7.1 and in the upper jaw 3.1.

Those who reported going to the dentist for regular check-ups had more teeth than those who only went to see the dentist when they had pain or other problems (24.6 vs. 20.7). Subjects who brushed their teeth less often than once a day had less teeth than those who brushed more frequently (20.3 vs. 23.6).

## **Distribution of teeth**

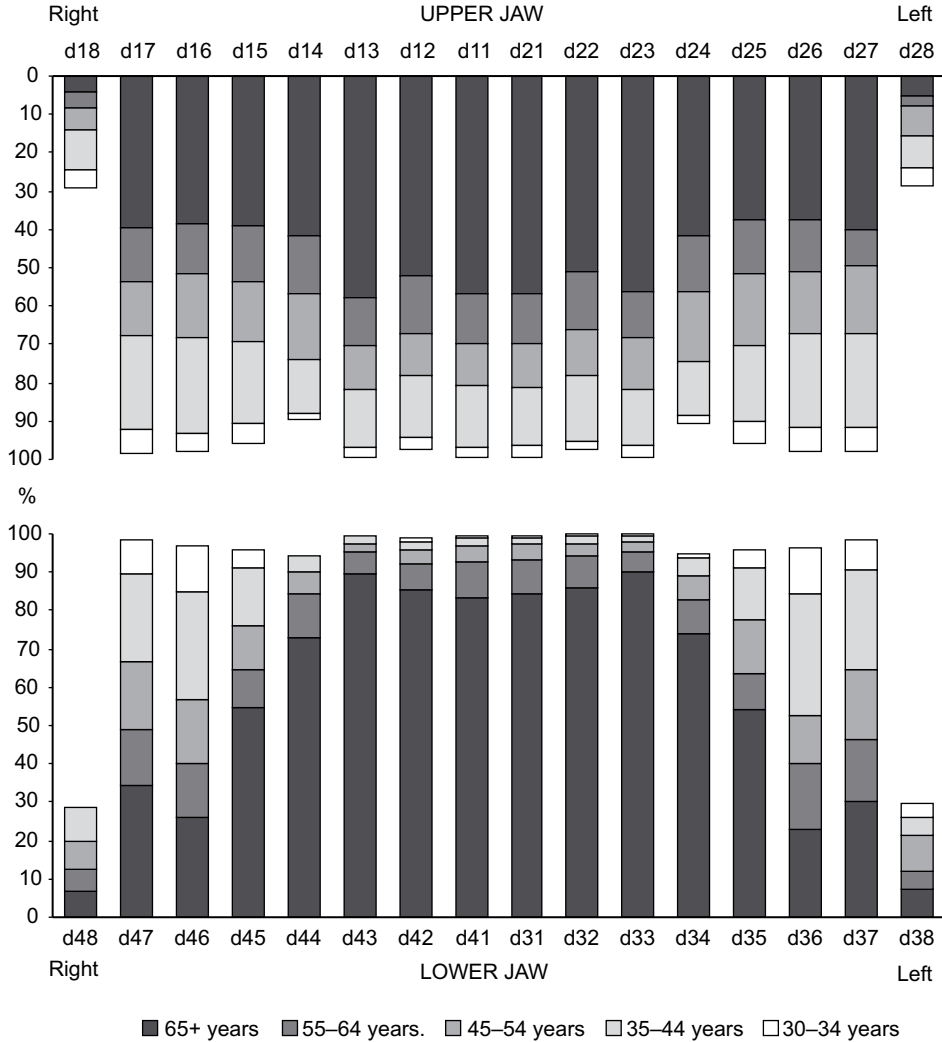
Of the dentate subjects over 95% had anterior teeth in the lower jaw and about 80% in the upper jaw. In the posterior areas, upper third molars were the most often missing teeth. Of the dentate subjects, 16% had d18 and 17% had d28 present. About 70% of the dentate subjects had first molar (d16 or d26) in the upper jaw and 60% in the lower jaw (d36 or d46).

Figure 6.1. shows cumulative percentages for the presence of each tooth, by age group. In the youngest age groups (30–44 years) missing teeth were rare. Elderly people had often lost all their teeth in the upper jaw or premolars and molars in the lower jaw (Figure 6.1.).

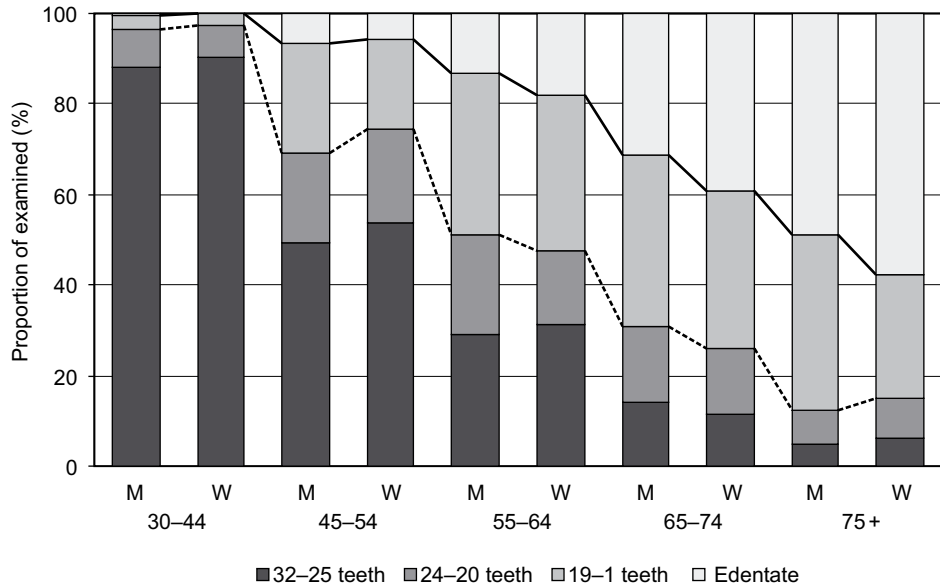
## **Minimum number of 20 teeth**

Of all the subjects, 66% had a minimum of 20 teeth. The percentage among working-aged subjects (30–64 years) was 77%, among older subjects 23% and in the WHO reference age group (35–44 years) 96%. In the age group 55–74 years the percentage was higher among men than women (Figure 6.2.).

**Figure 6.1. Presence (%) of teeth (d18...d48) cumulatively by age group in dentate subjects (n=5,401).**



**Figure 6.2. Distribution (%) of subjects by age group and number of teeth in men (M) and women (W) (n=6,314, number of teeth does not include tooth remnants). Dotted line indicates proportion of subjects with a minimum of 20 teeth, solid line the percentage of dentate subjects.**



## 7. DENTAL STATUS

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### Methods

#### Examination of teeth

The condition of teeth was always examined in the same order (see Figure 1.4.1., page 14). The identification of a tooth and the determination of the status of teeth were based on the methodology used in the Mini-Finland survey (Vehkalahti et al. 1991) as well as on WHO guidelines (1997). All tooth surfaces were examined, but observations were recorded by tooth. The status of each tooth was determined as follows:

- **Sound tooth:** no filling, fracture or caries.
- **Decayed tooth:** Caries lesion clearly extending to dentin and requiring at least a filling for adequate treatment. The caries lesion was to be cavitated, to have penetrated the fissure and undermined the enamel, or the dentin walls were to have clearly softened. Teeth with coronal or root caries were recorded separately.
- **Filled tooth:** Filling but no caries and no fracture. Prosthetic crowns and bridges were also recorded as fillings, but not veneers or other measures to fill out the tooth.
- **Fractured tooth:** No caries, but fracture in tooth or filling extending to dentin, or filling had come loose or was clearly incomplete or the tooth had a temporary filling.
- **Residual root:** More than half of all the tooth's vertical surfaces were damaged. Residual roots were entered as either caries or non-caries roots, such as those left as a support for overdentures.

In some cases it was not possible to determine the status of a tooth. This happened in cases of an orthodontic band or a tooth being fully covered with plaque or calculus. A separate code was entered for this situation. A total of 12 subjects had this situation in one or more teeth.

## **Indicators for dental status**

Indicators of subjects' dental status were calculated for the dentate subjects if the condition of the subject's all teeth had been clinically determined (n=5,389). These indicators were: numbers of all teeth, sound teeth, decayed teeth (DT), filled teeth (FT), and teeth in need of treatment. Residual roots with caries were included in DT and non-caries roots in FT. Teeth in need of treatment included DT and fractured teeth.

Dental status in subgroups by age, gender and level of education was illustrated as percentages of subjects having each condition and as mean values of the indicators for dental status.

## **Results**

### **Dental status by age and gender**

The mean number of teeth was 22.9. On average 9.4 of these were sound, 12.4 had fillings, 0.8 had caries and 0.2 were fractured. In the age group 30–34 the majority of all teeth were sound, in older age groups filled teeth dominated (Table 7.1. and Appendix Table 7.1.).

Most teeth were sound or filled but otherwise healthy. In the youngest age group over half of the teeth were sound, in the age group 65 or over about one-third. The mean number of teeth requiring treatment was among men twice as high as among women (1.4 vs. 0.7).

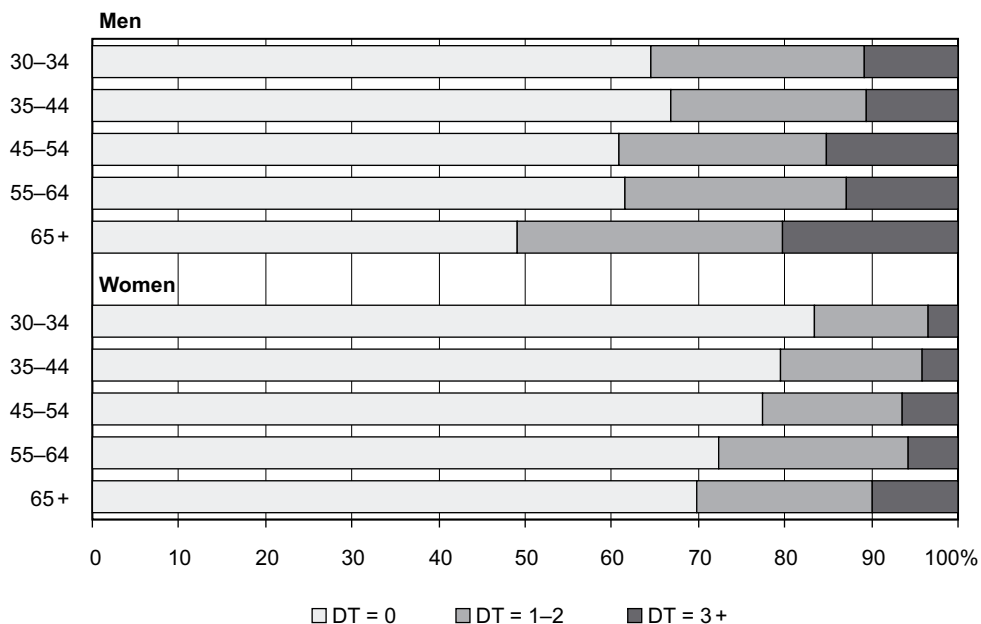
Almost all (95%) dentate subjects had at least one sound tooth. Of all, 47% had no more than 9 sound teeth, 33% had 10–17 sound teeth and 15% had 18–32 sound teeth (Appendix Table 7.2.). There were no marked differences between men and women. Men had an average of 10.0 and women 8.9 sound teeth (Appendix Table 7.1.). The gender difference was most pronounced in the age group 55–64, where men had an average of 7.7 and women 6.1 sound teeth.

**Table 7.1. Mean numbers of teeth by status in dentate men and women in three age groups (n=3,027).**

Status of teeth	30–34 yrs		45–54 yrs		65 or over	
	Men	Women	Men	Women	Men	Women
Sound, no filling	16.9	16.9	8.9	7.5	5.6	4.7
Filled, no caries	10.5	10.8	12.0	14.6	8.3	9.4
Decayed	1.0	0.3	1.2	0.5	1.5	0.8
Fractured, no caries	0.2	0.1	0.3	0.3	0.2	0.2
All teeth	28.6	28.1	22.4	22.9	15.6	15.1

Caries occurred (DT>0) in 31% of dentate subjects, in women less often than in men (23% vs. 39%) and in subjects aged 30–44 less often than in the elderly (26% vs. 39%). When caries was found, it usually occurred in one or two teeth. A greater number of DT was seen in 10% of all dentate subjects, 14% of men and 6% of women (Figure 7.1.).

**Figure 7.1. Distribution (%) of dentate women (n=2,856) and men (n=2,533) by number of decayed teeth (DT) and by age group.**



The mean number of DT was 0.8; men had on average 0.8 decayed teeth, women 0.5. The differences between men and women were similar in all subgroups by age, with averages for 30–64-year-olds ranging among men from 1.0 to 1.3 and



among women from 0.3 to 0.6. The oldest subjects had clearly more decayed teeth than the others had: mean DT for men aged 75 or over was 1.7 and for women 1.2, compared to 1.1 and 0.5, respectively, in the age group 65–74.

### Dental status by education

Dental status was clearly associated with level of education. People with the most education had more sound and filled teeth and less caries than had the other subjects. Men with a higher education had an average of 11.6 sound teeth and those with a basic education, 7.9 sound teeth. The corresponding figures for women were 10.9 and 6.3. The difference between the educational categories was most pronounced among women aged 30–34 (Table 7.2).

**Table 7.2. Mean numbers of sound teeth, filled teeth and decayed teeth in dentate men and women in three age groups (n=3,027) by level of education.**

Status of teeth Level of education	30–34 years		45–54 years		65+ years	
	Men	Women	Men	Women	Men	Women
<b>Sound teeth</b>						
Basic	16.0	15.0	8.0	6.7	5.4	4.6
Intermediate	16.6	16.5	9.1	7.3	5.9	5.0
Higher	17.7	17.4	9.6	8.4	6.0	5.5
<b>Filled teeth</b>						
Basic	10.6	11.5	9.4	12.4	6.6	8.2
Intermediate	10.7	11.0	12.3	14.3	10.6	9.8
Higher	10.1	10.6	15.0	16.7	12.7	14.1
<b>Decayed teeth</b>						
Basic	1.2	1.2	1.6	0.6	1.7	0.9
Intermediate	1.2	0.4	1.3	0.6	1.3	0.7
Higher	0.6	0.2	0.7	0.5	1.0	0.5

The percentage of subjects with caries (DT>0) was clearly lower among subjects with a higher education (20%) than those with a basic education (39%). Among men, these figures were 25% and 48%, and among women, 17% and 30%. The difference was seen in all age groups among both women and men. Similar differences by levels of education were also seen in the prevalence of a greater number of decayed teeth (DT=3+). Among subjects with a higher education, only 4% had at least three decayed teeth compared to 14% among those with a basic level of education. The figures for men were 6% and 19% and for women 3% and 9%. Among subjects with a higher level of education, only 4% had at least three decayed teeth compared to 14% among those with a basic level of education.

## Dental status by oral health behaviour

Having regular dental check-ups was associated with greater numbers of all teeth, sound teeth and filled teeth and with fewer teeth requiring treatment. Sound teeth dominated among those with their check-up interval longer than two years and filled teeth among those having check-ups annually.

Occurrence of caries (DT>0) was lower for those brushing their teeth at least twice a day in comparison with those brushing less than daily (24% vs. 59%). Among men, in the age group 65 or over, these figures were 43% vs. 70%. Accordingly, number of DT was as highest in subjects brushing their teeth less than daily (2.7), in comparison with those brushing once a day (1.0) or at least twice a day (0.5). The difference was similar for both genders and in each age group.

Regardless of the regularity of dental check-ups, the frequency of tooth brushing correlated both with the number of sound teeth and with the number of teeth requiring treatment in men: those who brushed their teeth less regularly than once a day had the lowest number of sound teeth and the highest number of teeth requiring treatment (Table 7.3.). Among women this association was seen only among those who did not have regular check-ups. Regardless of the frequency of dental check-ups, the greatest number of filled teeth was found in those who brushed their teeth at least twice a day.

**Table 7.3. Mean number of sound teeth, filled teeth and teeth requiring treatment in dentate men (n=2,533) and women (n=2,856) by regularity of dental check-ups and frequency of tooth brushing.**

Status of teeth Frequency of brushing	Regular check-ups		No regular check-ups	
	Men	Women	Men	Women
<b>Sound teeth</b>	<b>10.0</b>	<b>9.4</b>	<b>10.1</b>	<b>8.2</b>
At least twice a day	10.0	9.4	10.8	8.5
Once a day	10.2	9.3	10.1	7.8
Less often	8.9	--	8.8	5.3
<b>Filled teeth</b>	<b>14.0</b>	<b>14.9</b>	<b>9.0</b>	<b>10.1</b>
At least twice a day	14.4	15.0	10.1	10.7
Once a day	13.7	14.0	9.0	9.2
Less often	13.4	--	7.2	4.3
<b>Teeth requiring treatment</b>	<b>0.7</b>	<b>0.4</b>	<b>2.2</b>	<b>1.3</b>
At least twice a day	0.5	0.4	1.5	1.1
Once a day	0.7	0.3	2.1	1.6
Less often	1.0	--	3.7	4.3

-- less than 50 observations

## 8. PERIODONTAL STATUS

*Matti Knuuttila and Liisa Suominen-Taipale*

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### Methods

The periodontal status was determined by measuring the depth of periodontal pockets and the presence of bleeding observed on probing (BOP). The depth of periodontal pockets was measured from all teeth except for third molars and residual roots. The sequence of the examination is shown in Figure 1.4.1. (Page 14. The measurements were made using a WHO periodontal probe (Plandent Oyj, no. 19577) with a ball end and markings at 3.5 and 5.5 mm. A force of 20 g was used in the measurements, and the measurement force was calibrated each morning by the examining dentist using a letter scale. The depth of periodontal pockets around each tooth was measured at four points in the following order: distal angle and midpoint on the buccal side, midpoint on the lingual side and mesial angle. The deepest measurement for each tooth was recorded in one of three categories: “no deepened periodontal pocket”, “4–5 mm pocket ” and “6 mm pocket or deeper”.

The prevalence of periodontitis was determined as percentage of subjects with one or more teeth with a periodontal pocket of  $\geq 4$  mm. Subjects with one or more teeth with a periodontal pocket of  $\geq 6$  mm were defined as having the severe form of periodontitis. Severity of periodontitis was described as mean number of teeth with periodontal pockets  $\geq 4$  mm or  $\geq 6$  mm.

Bleeding on probing was recorded immediately after the measurement of pocket depth: “yes” or “no”. Observations of bleeding in the upper jaw were recorded immediately after the measurement of periodontal pockets in the maxillary teeth. This was completed before proceeding to the measurement of pockets around the mandibular teeth and the assessment of bleeding from these pockets. Observations were recorded by sextant. The prevalence of gingivitis refers to the percentage of subjects in whom bleeding on probing appeared in one or more of the sextants.

## Results

### Gingivitis

Gingivitis was observed in 74% of the subjects; for men the figure was 77% and for women 70%. Gingivitis was least prevalent in the youngest age group both in women and men (Table 8.1).

**Table 8.1. Percentage of subjects with gingivitis in at least one sextants in dentate men and women by age (n=5,245).**

	Age group					
	All	30–34	35–44	45–54	55–64	65+
All	74	68	72	76	77	73
Men	77	71	76	80	78	75
Women	70	64	68	71	75	72

### Prevalence of periodontitis

Of all dentate, 64% had periodontitis (at least one tooth with a pocket of  $\geq 4$  mm) ranging from 48% in the youngest age group to 70% in the oldest (Table 8.2). The percentage of subjects who suffered from the severe form of periodontitis (at least one tooth with a pocket of  $\geq 6$  mm) was 21% ranging from 6% in the youngest age group to 31% in the oldest. Periodontitis occurred more frequently among men than women (Figure 8.1).

### Severity of periodontitis

The mean numbers of teeth with pockets in dentate subjects were 4.2 ( $\geq 4$  mm) and 0.7 ( $\geq 6$  mm) (Table 8.3). Men had on average more teeth with  $\geq 4$ mm pocket but fewer with  $\geq 6$  mm pocket than had the women.

For men the mean number of teeth with  $\geq 4$ mm pocket was highest in age group 45–64 and for women in 55–64. For teeth with  $\geq 6$  mm pocket the respective figures in men were highest in the oldest age group (65+) and in women in 55–64.

Periodontitis was found to be significantly accumulated among both men and women. In dentate men, 25% of the studied had 69% of all the recorded teeth with pockets  $\geq 4$ mm. This quarter had at least 9 teeth with pockets  $\geq 4$ mm. The corresponding figures for women were 78% and at least 6 teeth with pockets  $\geq 4$ mm.

**Table 8.2. Percentage of subjects with periodontitis (at least one tooth with deepened periodontal pocket) in dentate men and women by age (n=5,255).**

<b>Gender</b> Categories of pocket depths	Age group					
	All	30–34	35–44	45–54	55–64	65+
<b>All</b>						
≥ 4 mm <sup>1</sup>	64	48	61	69	69	70
≥ 6 mm	21	6	14	24	29	31
<b>Men</b>						
≥ 4 mm <sup>1</sup>	72	56	69	76	76	76
≥ 6 mm	26	8	19	30	35	39
<b>Women</b>						
≥ 4 mm <sup>1</sup>	57	40	52	62	62	64
≥ 6 mm	16	4	10	17	23	25

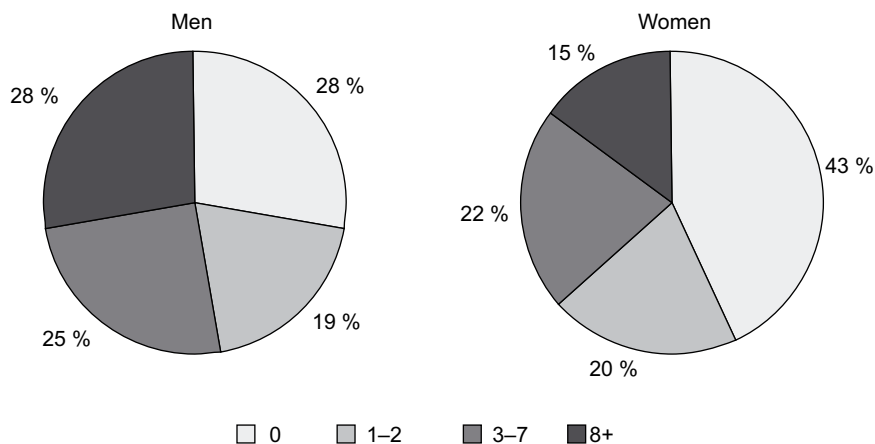
<sup>1</sup> includes teeth with ≥ 6 mm pockets

**Table 8.3. Severity of periodontitis (mean number of teeth with deepened periodontal pockets) in dentate men and women by age (n=5,255).**

<b>Gender</b> Categories of pocket depths	Age group					
	All	30–34	35–44	45–54	55–64	65+
<b>All</b>						
≥ 4 mm <sup>1</sup>	4.2	2.7	3.9	4.9	4.6	4.4
≥ 6 mm	0.7	0.2	0.4	0.8	1.0	1.0
<b>Men</b>						
≥ 4 mm <sup>1</sup>	5.3	3.4	4.9	6.2	5.5	5.4
≥ 6 mm	0.4	0.1	0.2	0.5	0.6	0.7
<b>Women</b>						
≥ 4 mm <sup>1</sup>	3.2	2.0	2.8	3.6	3.7	3.6
≥ 6 mm	0.9	0.2	0.6	1.1	1.4	1.3

<sup>1</sup> includes teeth with ≥ 6 mm pockets

**Figure 8.1. Distribution (%) of subjects according to number of teeth with periodontal pockets ( $\geq 4\text{mm}$ ) and gender ( $n=5,255$ ).**



### **Periodontitis by education**

As a whole, only minor differences in prevalence of periodontitis between educational levels occurred. Differences were, however, clearer regarding the severe form of periodontitis (Table 8.4).

Furthermore, association between prevalence of periodontitis and educational level varied between age groups, especially in men. In the age group 35–44 men with a basic education had more often periodontitis than men with a higher education (72% vs. 61%). In aged 55–64 the association was reversed; periodontitis was more common in the higher than the basic education category (71% vs. 86%). In women, the respective figures were 54% vs. 50% and 59% vs. 72%. Similar patterns were seen in prevalence of the severe form and severity of periodontitis.

**Table 8.4. Percentage of subjects with periodontitis (at least one tooth with deepened periodontal pocket) by age and level of education in dentate men (M) and women (W) (n=5,255).**

Categories of pocket depths	Age group											
	All		30–34		35–44		45–54		55–64		65+	
	M	W	M	W	M	W	M	W	M	W	M	W
<b>≥ 4 mm pockets<sup>1</sup></b>												
<b>All</b>	<b>71</b>	<b>57</b>	<b>56</b>	<b>40</b>	<b>69</b>	<b>52</b>	<b>76</b>	<b>62</b>	<b>76</b>	<b>63</b>	<b>76</b>	<b>65</b>
Basic	73	59	--	--	72	54	75	62	71	59	72	60
Intermediate	73	57	59	47	72	55	78	57	75	60	84	70
Higher	68	56	48	36	61	50	75	65	86	72	--	74
<b>≥ 6mm pockets</b>												
<b>All</b>	<b>26</b>	<b>16</b>	<b>8</b>	<b>4</b>	<b>19</b>	<b>10</b>	<b>30</b>	<b>17</b>	<b>35</b>	<b>23</b>	<b>39</b>	<b>25</b>
Basic	33	19	--	--	29	12	37	19	33	21	34	22
Intermediate	26	17	11	6	22	14	32	21	34	22	39	28
Higher	19	11	3	3	8	5	20	12	40	27	60	33

<sup>1</sup> includes teeth with ≥ 6 mm pockets

-- less than 50 observations

### Periodontitis by oral health behaviour

Daily frequency of tooth brushing was associated with lower prevalence and severity of periodontitis. However, the difference between those who brushed their teeth at least twice a day and those who brushed their teeth less often than daily was minor (Table 8.5.).

Hardly any difference in prevalence of periodontitis was seen between subjects who reported to have regular dental check-ups as compared to subjects who reported to see the dentist only when in pain or experiencing problems (in men 70% vs. 74%, in women 57% vs. 58%). Difference in severity was seen primarily in men only (in men 4.7 vs. 6.0, in women 3.0 vs. 3.5)

**Table 8.5. Percentage of subjects with periodontitis (at least one tooth with periodontal pocket ≥ 4mm) and severity of periodontitis (mean number of teeth with periodontal pockets ≥ 4mm) in dentate men and women (n=5,055) by frequency of tooth brushing.**

Frequency of tooth brushing	Subjects with periodontitis (%)		Severity of periodontitis (Mean no. of teeth with pockets)	
	Men	Women	Men	Women
At least twice a day	71	57	5.1	3.2
Once a day	70	56	5.1	3.1
Less often	79	60	6.6	4.0

## 9. TEMPOROMANDIBULAR DISORDERS

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[http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)

### Methods

Masticatory function was assessed at the beginning of the clinical oral examination (n=6,318); this took about one minute. The examination was based on the research diagnostic criteria suggested by Dworkin and LeResche (1992), but was confined to the most common aspects of temporomandibular disorders (TMD). Signs and symptoms of TMD that were recorded included restricted mouth opening, pain in temporomandibular joints or in masticatory muscles, and sounds (clicking and/or grating) from temporomandibular joints during mouth opening. Pain in temporomandibular joints or masticatory muscles were assessed both by asking the subjects and by observing facial expressions; all other findings were based on clinical measurements. No questions were presented on earlier or perceived TMD symptoms.

Maximum mouth opening was measured as the distance between the incisal edges of the upper and lower front teeth and was recorded as being restricted if it was less than 40 mm. The temporomandibular joints were palpated with the index finger, applying a pressure of 0.5 kg to a point about one finger's width in front of the ears while the subject opened mouth two times consecutively. Clicking and/or grating sounds appearing during the mouth opening and their location on the left or right side were recorded. The subjects were asked whether they experienced pain in temporomandibular joints during the palpation ("yes", "no") and affirmative answers were recorded in the left, right or both sides. The temporalis and masseter muscles were palpated separately on both the left and right side. The temporalis was palpated in the temple region, at about 2 cm from the corner of the eye, and the masseter above the lower jaw angle. The muscles were palpated with one finger, applying a pressure of about 1 kg. In connection with each palpation the subjects were asked whether they experienced pain ("yes", "no") and affirmative answers were recorded in the left, right or both sides.



## Results

TMD signs and symptoms most commonly occurred in temporomandibular joints either as sounds or pain; these were observed in 24% of all subjects. The prevalence of other findings varied in the range of 4–14%. Women had all TMDs more often than men in all age groups. TMDs were more common in the oldest age groups than in the youngest age groups (Table 9.1.). Likewise, they were more common in subjects wearing removable dentures as compared to those who did not wear removable dentures (Table 9.2.).

Regarding the findings in temporomandibular joints among women, these were the more common the older the women, among men the figures were more or less constant across all age groups (Table 9.1.). The most common finding in temporomandibular joints was clicking (15% of all subjects) and the least common pain (4%). Findings in temporomandibular joints were equally common in removable denture users as among non-users (Table 9.2.).

Restricted mouth opening was observed in 9% of the subjects. Older subjects and women had more often difficulties in opening their mouth than younger people and men (Table 9.1.). Restricted mouth opening was seen in a much larger percentage of removable denture wearers than among subjects who did not wear removable dentures. The difference was most pronounced in the oldest age groups (Table 9.2.).

Pain in masticatory muscles during palpation was reported by 14% of the subjects, and most of them experienced pain in one muscle only. In all age groups women reported pain two to three times more often than men (Table 9.1.). In the age groups 65–74 and over 74, palpatory pain was reported more than twice as often (22% and 31%) as in the younger age groups (9–14%). Pain in either temporomandibular joints or masticatory muscles was reported by 15% of the subjects. Especially in older age groups users removable denture wearers had more often pain in masticatory muscles than subjects who did not wear removable dentures (Table 9.2.).

**Table 9.1. Prevalence (%) of temporomandibular disorders (TMD) in men (M) and women (W) by age group (n=6,318).**

TMD	Age group											
	All		30-44		45-54		55-64		65-74		75+	
	M	W	M	W	M	W	M	W	M	W	M	W
Restricted mouth opening	6	12	3	6	4	9	8	14	12	17	20	27
Findings in temporomandibular joints <sup>1</sup>	19	29	17	23	19	32	20	29	18	34	20	37
Pain in temporomandibular joints <sup>2</sup>	2	5	3	3	3	5	2	6	1	6	2	8
Pain in masticatory muscles <sup>3</sup>	8	19	5	13	5	16	8	20	15	28	20	36

<sup>1</sup> Clicking and/or grating sounds or pain on palpation in connection with opening mouth and excursions

<sup>2</sup> Pain on palpation in left, right or both joints in connection with opening mouth and excursions.

<sup>3</sup> Pain on palpation in left or right masseter or temporalis superficialis in connection with opening mouth and excursions.

**Table 9.2. Prevalence (%) of temporomandibular disorders (TMD) by age group and wearing of removable dentures<sup>1</sup> (n=6,318).**

TMD	Age group						
	All	30-44	45-54	55-64	65-74	75+	
<b>No removable dentures</b>							
Restricted mouth opening	6	4	7	9	12	12	
Findings in temporomandibular joints <sup>2</sup>	23	20	26	23	25	33	
Pain in temporomandibular joints <sup>3</sup>	3	3	4	3	3	6	
Pain in masticatory muscles <sup>4</sup>	11	9	10	12	18	21	
<b>Removable dentures</b>							
Restricted mouth opening	15	10	6	14	16	27	
Findings in temporomandibular joints <sup>2</sup>	27	20	25	27	28	31	
Pain in temporomandibular joints <sup>3</sup>	5	2	4	6	5	6	
Pain in masticatory muscles <sup>4</sup>	21	8	12	17	24	33	

<sup>1</sup> Full or partial dentures (maxillary, mandibular or both)

<sup>2</sup> Clicking and/or grating sounds or pain on palpation in connection with opening mouth and excursions

<sup>3</sup> Pain on palpation in left, right or both joints in connection with opening mouth and excursions.

<sup>4</sup> Pain on palpation in left or right masseter or temporalis superficialis in connection with opening mouth and excursions.

# 10. MALOCCLUSIONS

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## Methods

Occlusal features were measured in the clinical examination of those subjects who had a sufficient number of teeth in both jaws for the measurements to be conducted. In the health interview, the subjects were asked, “Have you ever received orthodontic treatment?” Two response options were given, yes and no.

The criteria used in this study were adopted from the dental health assessment of the Index of Orthodontic Treatment Need (Brook and Shaw 1989) and earlier assessments of young Finnish adults (Svedström-Oristo et al. 2000). The feasibility of these criteria has been established in studies by Richmond et al. (1994) and Svedström-Oristo et al. (2002).

Only malocclusions involving an obvious risk of poor prognosis of occlusion, e.g. impairment caused by dental wear or weakening of periodontal support with ageing or by the decrease in the number of contacting pairs of teeth, were included in the study. The following occlusal features were considered risk factors: frontal and lateral crossbite, lateral scissors bite, large overjet (7 mm or more), open bite and traumatic deep bite.

The following features were measured from natural teeth: overjet (OJ), overbite (OB), frontal and lateral crossbite (CB) and lateral scissors bite (SB). Overjet was classified in four categories: 1) normal 1–6 mm, 2) increased 7–9 mm, 3) negative <0mm, and 4) strongly increased >9 mm. Overbite was likewise classified in four categories: 1) normal, 2) increased, 3) open bite, and 4) traumatic, i.e. lower incisors in contact with palatal mucosa. The sagittal relationship was measured on the canines in four categories: Angle Class I, Class II, Class III, and cusp to cusp.

## Results

One-third of the dentate subjects had at least one risk factor impairing their prognosis of occlusion. The most common malocclusion was frontal or lateral crossbite, which was most prevalent in the age group 45–54 and which decreased in prevalence in older age groups. Similarly, the prevalence of scissors bite was

lower in older age groups. The prevalence of other features did not vary between different age groups. The prevalence of deviating features is shown in Table 10.1.

Comparisons with population studies from other countries revealed no major differences in the prevalence of deviating occlusal features (Table 10.2). The differences observed in prevalences appeared to be due to the different cut-off levels applied in various studies. The percentage of subjects with a history of orthodontic treatment in the United States and the Netherlands seemed to be distinctly higher than in Finland.

**Table 10.1. Percentage of dentate subjects with malocclusions increasing the risk of poor prognosis (n = 4,711) or having received orthodontic care (n=572).**

	Age group					
	All	30–44	45–54	55–64	65–74	75+
Occlusal deviation <sup>1</sup>	31	32	34	28	23	26
Cross bite	18	18	21	17	11	14
Scissors bite	6	8	5	3	3	3
Large overjet	7	5	8	6	8	9
Open bite	2	2	2	1	1	3
Traumatic deep bite	4	4	5	5	7	4
Orthodontic treatment received	10	19	5	3	2	1

<sup>1</sup> one or more occlusal deviation increasing the risk of poor prognosis

**Table 10.2. Comparison of the Health 2000 Survey with other population based studies with measures of malocclusions.**

	Study			
	Finland Health 2000 n=4,711 Age 30+	Netherlands Burgersdijk et al. 1991a n=3,526 Age 15–74	Sweden Salonen et al. 1992 n=669 Age 20+	USA Brunelle et al. 1996 n=4,760 Age 18–50
Occlusal deviation				
Cross bite	18		28	11
Scissors bite	6		4	
Large overjet	7 (7 mm)	23 (> 5 mm)		8 (> 6 mm)
Open bite	2	3	2	5
Traumatic deep bite	4	0–6	5	8
Orthodontic treatment received	10	14–21	0–28	19

# 11. SPACES IN DENTAL ARCHES

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[http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)

## Methods

Spaces in dental arches were determined in the entire dentition with the exception of the third molars. The presence of spaces and whether or not they had been filled were examined separately in the molar, premolar and anterior regions. Canine teeth were assessed as part of the anterior region. Spaces were diagnosed separately in the right and left hand side of the upper and lower jaws; the entries were thus obtained from ten different regions: four in molar teeth, four in premolar teeth and two in anterior teeth. In each region entries were made based on the following classification: a) no space, b) space filled with dental prostheses, or c) unfilled space. Both removable dentures and fixed bridges were regarded as dental prostheses.

A space was recorded as present in the molar region when both molar teeth were missing. In the premolar and anterior region, a space was recorded when at least one tooth was missing and a clearly observable space (6 mm or wider) was detected.

The percentages of subjects with spaces were estimated for the dentate participants in the clinical oral examination in three subgroups: for those who had teeth in the upper jaw ( $n=4,672$ ), in the lower jaw ( $n=5,359$ ) or in both jaws ( $n=4,656$ ).

## Results

Having one or more spaces was more common in men than women (44% vs. 39%) and less common in younger subjects than older subjects (Table 11.1.). At least one space was observed in 16% of those aged 30–44, 57% of those aged 45–64 and in 84% of those aged 65 or over. The vast majority of spaces were unfilled. This was equally conspicuous among young and old subjects as well as in men and women.

Spaces were least prevalent in the mandibular anterior region (in 8% of subjects) and most prevalent in the mandibular premolar and molar regions (30%) and the maxillary premolar region (27%). Spaces observed in the anterior regions had been filled with dental prostheses both in the upper and lower jaw; only 2% of women and 3–5% of men had unfilled spaces in these regions (Figure 11.1).

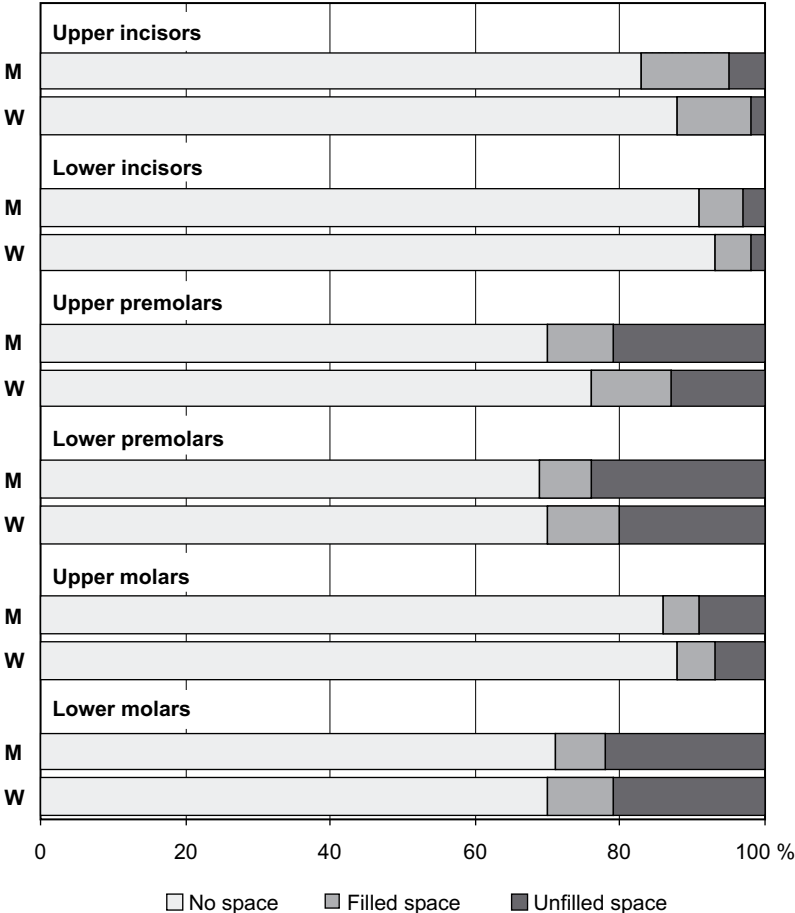
**Table 11.1. Percentage of subjects according to the presence and status of spaces in dental arches in dentate men (M) and women (W) who had teeth in both jaws (n=4,656).**

Spaces <sup>1</sup> (whole mouth)	Age group							
	All		30–44		45–64		65+	
	M	W	M	W	M	W	M	W
<b>No spaces</b>	<b>56</b>	<b>61</b>	<b>82</b>	<b>86</b>	<b>39</b>	<b>47</b>	<b>15</b>	<b>17</b>
<b>Spaces</b>								
Filled with dental prostheses <sup>2</sup>	7	8	3	3	9	11	19	19
Unfilled	37	31	15	11	52	42	66	64

<sup>1</sup> Criteria for a space: two adjacent molar teeth missing or one other tooth missing and observed space 6 mm or wider.

<sup>2</sup> Removable or fixed dentures

**Figure 11.1. Percentage of subjects according to the presence and status of spaces in dental arches by type of tooth in dentate men (M) and women (W) who had teeth in upper jaw (n=4,672) and in lower jaw (n=5,359).**



## 12. PREVALENCE OF REMOVABLE DENTURES AND NEED FOR REPAIR

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[http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)

Presence of removable dentures was recorded during the clinical oral examination or the home health examination from a total of 6,727 subjects. In the clinical oral examination the dentist recorded the type and location of removable dentures by jaw and examined them for cleanliness, condition and fit. At the end of the clinical examination the subjects were asked how old their dentures were, what repairs had been made to them and whether they had been relined during the past five years. Finally, the subjects were asked whether they themselves thought their dentures were in need of repair. During the home health examination only the type and location of removable dentures were recorded by the public health nurse who was trained to carry out the oral examination.

In the clinical oral examination data on removable dentures, i.e. their type (full dentures, partial dentures), need for repair, age (less than or more than 5 years) and earlier repairs were recorded separately for the upper and lower jaw. For the determination of cleanliness and need for repairs or relining, they were removed from the subject's mouth. If the subject had a partial denture, the occlusion status of a partial denture was measured by pulling occlusion paper from the side of clenched teeth. If the paper did not move, occlusion status was defined as tight.

### Results

Of the subjects, 32% had removable dentures, 28% of men and 35% of women. The most common type of denture was a maxillary full denture. Of all, 25% had a full denture in the upper or lower jaw or both, 11% had a partial denture in the upper or lower jaw or both. About 5% had combinations of full and partial dentures: these were almost always combinations of a maxillary full dentures and a mandibular partial denture (Table 12.1., Appendix Tables 12.1. and 12.2.).

Removable dentures were most prevalent in older age groups (>65 years old). Every other person aged 75 or over had a full denture in the upper and lower jaw. One-fifth (19%) of those aged over 55 had at least one partial denture.

Removable dentures were clearly more common among those with a lower level of education (55%) as compared to those with an intermediate (22%) or higher education (10%). Removable dentures were more common in northern and eastern Finland than elsewhere in the country.

**Table 12.1. Percentage of subjects (n=6,727) according to the type of removable dentures among subjects participating in the clinical oral examination or the home health examination.**

Type of dentures in upper / lower jaws	Age group					
	All	30–44	45–54	55–64	65–74	75+
Full / Full	13	1	6	15	33	49
Full / Partial	5	<1	3	9	10	8
Full / –	7	1	10	12	10	11
Partial / Partial	2	<1	1	3	3	2
Partial / –	4	1	5	6	7	5
– / Partial	1	<1	1	1	2	1
Others	1	0	<1	<1	<1	1
No removable dentures	68	97	74	54	35	23

According to the dentist, almost half of the subjects who wore removable dentures (48%) needed repairs to their dentures. There was no gender difference in the need for denture repairs. The lowest need for repairs was seen in the youngest age group, otherwise there were hardly any differences between the age groups. Needs for repair occurred most often in upper dentures (Table 12.2.). According to the subjects' own assessments, 45% needed repairs on their dentures, with little variation between different age groups. The subjects, too, reported needs for repair in upper dentures somewhat more often than in lower dentures (Table 12.2.). The functionality of dentures as assessed on the basis of tightness of occlusion was poor in 21% of the subjects who wore removable dentures; the figure was higher among men (24%) than women (18%).



**Table 12.2. Distribution of dentists' and subjects' assessments of need for removable denture repairs (n=2,028).**

Need for repair	Age group					
	All	30-44	45-54	55-64	65-74	75+
<b>Dentist's assessment</b>						
No need	52	75	56	55	45	48
Yes in upper dentures	21	24	29	19	19	17
Yes in lower dentures	12	0	7	11	16	14
Yes in both	16	2	7	15	20	22
<b>Subject's assessment</b>						
No need	55	56	49	56	53	61
Yes in upper dentures	19	25	31	17	14	11
Yes in lower dentures	11	13	7	9	14	14
Yes in both	15	5	13	17	18	14

Subjects with removable dentures reported having had repairs done on upper dentures more often than on mandibular dentures, although overall repairs were done quite infrequently. Of denture wearers, 18% had had repairs done on upper dentures, 7% on lower dentures, and 9% on both during the past five years.

## 13. ORAL MUCOSAL LESIONS

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### Methods

As part of the clinical oral examination, the dentist examined the oral mucosa using a dental mirror and a sterile dressing. The examination was done in the same order every time, starting with an extraoral examination of the skin around the mouth, the lips and the vermilion junction of the lips. The intraoral examination started behind the right upper tuber while stretching the lips and cheek for a better view. The tuber area, upper sulcus and buccal mucosa were checked one after the other, after which the examination continued to the left side, checking the same areas and finally the hard palate. The examination of the lower jaw started in the left retromolar area, continued along the buccal and labial sulci and the alveolar crest to the right retromolar region. The patient was then asked to lift the tip of the tongue to the palate to facilitate examination of the anterior floor of the mouth and the ventral surface of the tongue. Next, the dentist took a firm grip round the tip of the tongue with a sterile dressing, stretched the tongue out of the mouth and turned it right and left to examine the dorsal surface and lateral margins of the tongue up to the base of the tongue, as well as the lingual sulci. Finally, the soft palate and the pharynx were examined using a dental mirror (Zain et al. 1995).

Oral mucosal lesions recorded and their definitions are seen in Table 13.1. The definitions of the lesions follow WHO recommendations and an earlier large population study (WHO 1980, Zain et al. 1995). White and red oral lesions, oral mucosal ulcer, swelling or tumour were considered lesions with an increased risk for oral cancer or an early stage of oral cancer. Corresponding clinical diagnoses are leukoplakia, erythroplakia (WHO 1978), lichen and oral cancer. Need for treatment was determined and whenever needed participants were referred to their own dentist or to an outpatient department of oral and maxillofacial diseases. An intraoral camera (Planmeca 2002 CC Proline ®) was used to document verified lesions. A total of 6,315 persons participated in the oral mucosal examination.

Oral mucosal lesions related to removable dentures (Table 13.1.) were recorded in subjects who wore removable dentures. Ulcer and mucosal hyperplasia were recorded separately on both jaws (n=2,022) and denture sore mouth only for the subjects who wore removable dentures in upper jaw (n=1,964).

**Table 13.1 Definitions of oral mucosal lesions examined.**

Mucosal lesion	Definition
White mucosal lesion <sup>1</sup>	All pathological white mucosal lesions: e.g. clinical leukoplakia and exclusively white lichenstrias.
Red mucosal lesion	All pathological red mucosal lesions: e.g. clinical erythroplakia, all lichen lesions, including distinct red areas.
Mucosal ulcer	All clinical ulcers (including ulcerated lichen) with abnormal mucosal surface, e.g. irregular, thick, tumid, yellowish or palpable.
Swelling or tumour	All palpable lumps, tumours, fibromas, hemangiomas and hyperplasias with a maximum dimension of > 5 mm.
Angular cheilitis	Size > 5 mm.
Pseudomembranotic fungal infection	Clear white lesion removable by scratching with a dental mirror.
Median rhomboid glossitis	Squared, reddish lesion in the midline of the dorsal tongue, which is clearly distinguished from the normal mucosa of the tongue, and most often palpable.
Fistula	Clearly defined infectious fistula with reddish and hyperplastic or tumid adjacent tissues.
Gingival hyperplasia	Gingival hyperplasia in the front teeth region, including at least two approximal spaces with a dilated 'papilla' or hyperplasia that extends to the attached mucosa.
<hr/>	
Removable denture wearers	
Ulcer	Ulcer, recess or erythema clearly connected to the dentures.
Mucosal hyperplasia	Folded, hyperplastic mucosa in connection with dental prosthesis.
Denture sore mouth	Examined only in subjects with removable dentures in upper jaw. Erythema, red hyperplastic or verrucous mucosal areas exactly corresponding to the area beneath the upper dentures

<sup>1</sup> Does not include bite marks, geographic tongue, erythema migrans or pseudomembranotic fungal infection.

## Results

Of all, 21% had oral mucosal lesions. Older subjects had lesions more often than younger subjects (Table 13.2.). In the age group under 55, 12% had lesions, in the age group over 55 the figure was 35%. No gender differences were seen except in subjects under 55 (13% in men, and 11% in women).

**Table 13.2. Percentage of subjects with oral mucosal lesions needing follow-up or treatment (n=6,315.)**

	Age group					
	All	30–44	45–54	55–64	65–74	75+
<b>All lesions<sup>1</sup></b>	<b>21</b>	<b>6</b>	<b>20</b>	<b>28</b>	<b>40</b>	<b>41</b>
Lesions indicating an increased risk for oral cancer <sup>2</sup>	8	4	8	9	12	12
White mucosal lesion	5	3	5	5	6	5
Red mucosal lesion	2	1	2	2	3	5
Mucosal ulcer	1	<1	1	<1	1	2
Swelling or tumour	1	<1	1	2	2	3
All lesions related to dentures <sup>3</sup>	14	1	11	20	31	33

<sup>1</sup> All lesions including those related to dentures

<sup>2</sup> White mucosal lesion, red mucosal lesion, mucosal ulcer, swelling or tumour

<sup>3</sup> Ulcer, mucosal hyperplasia or denture sore mouth

Mucosal lesions indicating an increased risk for oral cancer were found in 8% of the subjects. The most common type was a white mucosal lesion (5%), while the frequency of other lesions was 1–2%. Swellings or tumours were found in one out of 100 persons examined, mostly in elderly subjects (Table 13.2.). The total frequency of other mucosal lesions (angular cheilitis, pseudomembranotic fungal infection, rhomboid glossitis, fistula and gingival hyperplasia) was 2%.

In the whole study population the frequency of oral mucosal lesions related to removable dentures was 14% (Table 13.2.). The percentage of subjects with ulcers was 5%, with mucosal hyperplasia 4% and with denture sore mouth 9%. Angular cheilitis, denture sore mouth, pseudomembranotic fungal infection or rhomboid glossitis, all clinical manifestations of probable oral candidiasis, were observed in around 10% of all subjects examined and in 31% of subjects wearing removable dentures.

Of the subjects wearing removable dentures, 45% had lesions connected to the dentures (Table 13.3.). The most common was denture sore mouth, which was

found in 30% of subjects wearing upper removable dentures. The occurrence of denture sore mouth was not related to age. Ulcers related to removable dentures were found in 17%. Mucosal hyperplasia was less common, but was still found in 12% of the subjects. Ulcers and hyperplasia were less frequent in younger persons. Hyperplasia was more common in men (16%) than women (10%). No other gender differences were found. Ulcers related to removable dentures were more often diagnosed in the upper (9%) than in the lower jaw (6%). The same was true for hyperplasia (8% in the upper and in 3% in the lower jaw).

White mucosal lesions were found in 5%, red mucosal lesions in 3%, ulcers in 1% and swellings or tumours in 2% of subjects wearing removable dentures. Of subjects wearing removable dentures, 51% had some kind of oral mucosal lesions.

**Table 13.3 Percentage of subjects with oral mucosal lesions related to dentures in subjects wearing removable dentures (n=2,022).**

	Age group					
	All	30-44	45-54	55-64	65-74	75+
<b>All lesions<sup>1</sup></b>	<b>45</b>	<b>43</b>	<b>44</b>	<b>43</b>	<b>47</b>	<b>43</b>
Ulcer	17	12	15	15	21	16
Mucosal hyperplasia	12	5	12	13	13	11
Denture sore mouth <sup>2</sup>	30	37	31	30	29	31

<sup>1</sup> One or all of the following: ulcer, mucosal hyperplasia, denture sore mouth

<sup>2</sup> Only in persons wearing removable dentures in upper jaw (n=1,964).

## 14. PANORAMIC RADIOGRAPHY

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[http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)

### Methods

Digital panoramic radiography (Planmeca 2002 CC Proline, Planmeca, Helsinki, Finland) was carried out using imaging values of 58–68 kV and 4–10 mA depending on subject size.

Participation in the radiographic examination was voluntary. Radiographs were not performed in pregnant subjects or in participants who had a serious lumbar or spinal column deformity that might have hampered the imaging procedure. The study protocol had favourable opinion given by Advisory Board for Radiation Safety and the safety licence granted by Radiation and Nuclear Safety Authority, Finland.

Preliminary radiographic diagnoses were recorded and explained by the clinical dentist to the examined subject and given a paper copy of the radiograph. The radiographs were stored in Dimaxis software (Planmeca, Helsinki, Finland).

### Analysis of radiographs

Before the radiographs were analysed, the four specialists in oral radiology responsible for interpretation conducted preliminary assessments to agree on a common set of diagnostic criteria. For this purpose they analysed 50 panoramic radiographs, compared their diagnoses, and in the event of disagreement discussed the case until consensus was reached.

In the actual study, intra-examiner diagnostic quality was monitored by having the same radiologist re-examine an earlier image from at least the previous day at an interval of 30 radiographs.

The first step in the analysis was to assess the quality: they were graded as diagnostically good, adequate, acceptable, or unacceptable (of no diagnostic value). In a good radiograph the dentin-enamel border, periodontal ligament spaces and lamina dura of all teeth were clearly visible, and both condylar heads depicted. The radiograph was considered adequate if the anterior teeth were unsharp, or the periapical areas in some teeth were not depicted diagnostically. The quality

was unacceptable if a positioning or exposure error had destroyed the radiograph beyond recovery by adjustments on the viewing program.

The radiographic material consisted of 6,101 panoramic examinations, covering 96% of the participants in the clinical examination. Image quality was good in 1,616 images (26%), adequate in 4,485 (73%). Fourteen images (0.2%) were unacceptable and were excluded from the analysis.

The images were diagnosed by oral radiologists using a custom-made computer program. The number of permanent and deciduous teeth and their condition was assessed as missing, retained/impacted, carious root remains, infrabony root remains, dental implant, carious tooth, intact tooth. All the previous were counted as teeth, and the subject was classified as edentulous if none of the previous were present. The radiographic findings recorded were: periapical lesions, vertical infrabony pockets, horizontal bone loss, endodontically treated teeth, pulp amputations, inadequate root fillings, and condylar changes (diagnostic criteria, see Table 14.1.)

Subjects with findings that required immediate treatment were contacted by letter, advising them to seek further examinations and treatment.

**Table 14.1. Diagnostic criteria for radiographic findings.**

Finding	Diagnostic criteria
Periapical lesion	Some of the following: - Lamina dura locally absent or diffuse - Apical widening of the periodontal ligament space - Wide, apical radiolucent change
Vertical infrabony pocket	Vertical deformity within bone that extends along apically at least to middle third the root from the alveolar bone crest
Horizontal bone loss	Horizontally oriented bone loss extending apically, at least to the middle third of root length. Upper and lower jaws were assessed separately by sextants. Only sextants with at least two teeth were included.
Endodontically treated tooth	Pulp chamber and/or root canals filled with radio-opaque material
Pulp amputation	Some of the following: - Only pulp chamber filled - Root canal post/screw present, no visible root fillings - Slight amount of filling at the coronal part of the root pulp - Only some of the roots filled in a multi-rooted tooth
Inadequate root filling	Gap between root filling and radiographic root apex more than 3 mm; or root filling seen outside the apex
Condylar changes	
1) Arthrosis	At least two of the following findings: - Flattening, sclerosis or unevenness of the condylar head - Osteophytes ventrally or dorsally to the condylar head - Flattening and sclerosis of the articular eminence
2) Arthritis	Erosion or subchondral cyst of the condylar head

## Results

According to the radiographs 11% of the subjects were edentulous. Dentate subjects had on average 23 teeth. The younger the age group, the larger the number of teeth present. On average, persons aged 65 or over had ten fewer teeth than those aged 30–65. There were no differences in the average number of teeth present between men and women.

### Periapical lesions

Of the dentate subjects, 27% had at least one periapical lesion at the tooth apex. Most of these subjects (87%) had 1–2 periapical lesions. Only two subjects had over 10 lesions with a maximum of 14 lesions. Men exhibited more periapical lesions than women, and the lowest prevalence was found in the youngest age group (Table 14.2.).

There were no marked regional differences in the prevalence of periapical lesions, although the figures recorded in Oulu university hospital district representing northern Finland were lower than elsewhere in the country.

Among people of working age, the lowest prevalence was found for those with the highest level of education as well as for those who were elderly and who had no more than basic education.

### Vertical infrabony pockets

Vertical infrabony pockets were found in one out of ten dentate subjects, more often in older age groups (Table 14.2.). Men had more vertical infrabony pockets than women. In most cases one or two vertical infrabony pockets were found per subject (76% of the subjects in whom vertical infrabony pockets were observed). The number of vertical infrabony pockets per subject ranged from 1 to 13; 56% of the subjects had one.

Subjects with no more than basic education presented with twice as many findings as those with the highest level of education. There were also differences by income category, those in the highest income category had slightly less pockets than others.

### Horizontal bone loss

Horizontal bone loss was present in at least one sextant in either the upper or lower jaw in about 18% of the dentate subjects. The older subjects had clearly more often horizontal bone than the younger subjects. Men had clearly more horizontal bone loss than women (Table 14.2.).



**Table 14.2. Percentage of dentate men (M) and women (W) with radiographic findings by age (n=5,367).**

Finding	Age group											
	All		30–44		45–54		55–64		65–74		75+	
	M	W	M	W	M	W	M	W	M	W	M	W
Periapical lesions	31	23	25	18	36	27	34	27	36	21	33	20
Vertical infrabony pockets	11	8	4	3	13	8	18	13	23	15	13	12
Horizontal bone loss <sup>1</sup>	22	15	6	4	25	13	35	21	45	37	59	33
Endodontically treated teeth <sup>2</sup>	59	62	50	49	65	74	65	72	64	63	58	61
Condylar changes <sup>3</sup>	6	13	4	12	6	15	7	14	6	13	9	14

<sup>1</sup> n=5,200: only sextants with at least two teeth present were assessed

<sup>2</sup> Including pulp amputations

<sup>3</sup> n=6,101. Arthritis and/or arthrosis in left, right, or both temporomandibular joints

In both men and women, level of education was associated with horizontal bone loss up to age 54, so that those with no more than basic education had more bone loss than those with the highest level of education, among whom it was rare. In the lowest income category a similar difference was observed when compared with the highest income category.

### **Endodontically treated teeth**

Among dentate subjects, 60% had at least one endodontically treated tooth, women more often (62%) than men (59%). There were no significant differences between age groups, only those aged 30–44 had less endodontically treated teeth than other age groups (Table 14.2.). The number of endodontically treated teeth varied from one to 19 per subject (34% had one).

Among subjects of working age, the lowest number of endodontically treated teeth was found in those with the highest level of education and in those elderly persons who had no more than basic education. Those in the highest income category had more endodontically treated teeth than those with the lowest incomes. According to the geographical area, the lowest number of endodontically treated teeth was found in northern and eastern Finland.

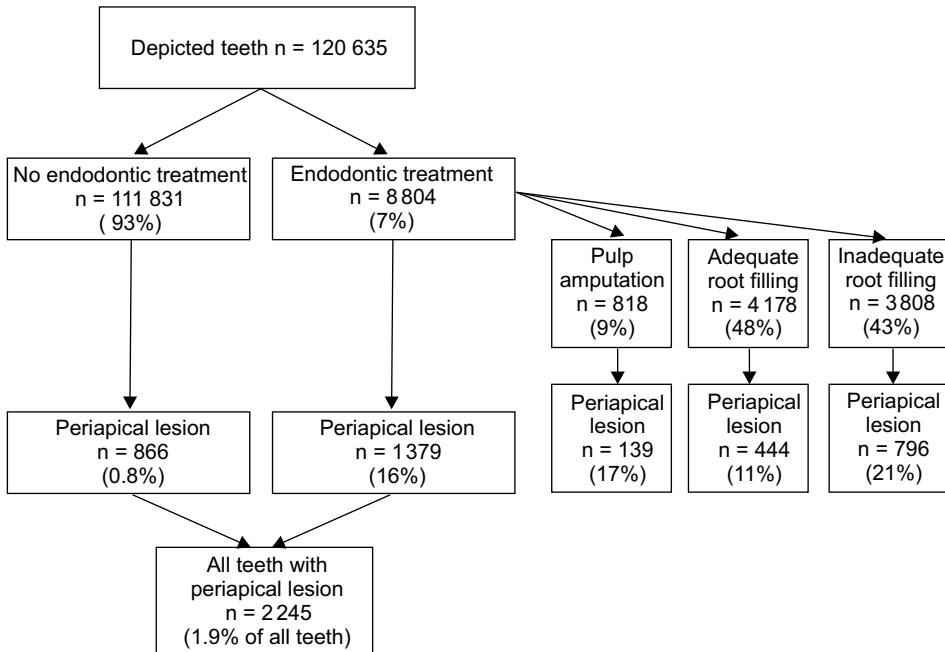
At least one endodontically treated tooth with inadequate root filling was found in 38% of the dentate subjects, the lowest frequency occurring in the youngest age group, as was the case with all endodontically treated teeth (Table 14.3.).

**Table 14.3. Percentage of dentate subjects (n=5,367) with inadequate root fillings by age.**

	All	Age group						
		30–44	45–54	55–64	65–74	75+	30–64	65+
<b>All</b>	<b>38</b>	<b>25</b>	<b>46</b>	<b>49</b>	<b>44</b>	<b>40</b>	<b>37</b>	<b>43</b>
Men	36	26	43	43	45	37	35	43
Women	40	24	48	54	44	42	39	43

In total, 7% of all teeth were endodontically treated, and the quality of the root fillings was assessed as adequate in about half of them. Periapical lesions occurred more often in endodontically treated teeth than in teeth with no root fillings. Periapical lesions were observed more often in association with inadequate root fillings or pulp amputations (Figure 14.1).

**Figure 14.1. Distribution of teeth by endodontic treatment, occurrence of periapical lesions and pulp amputations, and quality of root fillings.**



### Condylar changes

One in ten subjects showed changes in their temporomandibular joints, indicating arthrosis or arthritis. These findings were more common in women than in men (Table 14.2). Arthrotic changes were observed in 9% (women 13%, and men 6 %). Changes indicating arthritis were found in 30 subjects (total 0.5%, women 0.6 %, men 0.3 %).

## 15. CHANGES IN ORAL HEALTH AND HEALTH BEHAVIOUR 1980–2000

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### Methods

This chapter describes how the oral health and oral health habits of Finnish adults have changed over the 20-year period from 1980 to 2000. The 1980 data are based on the nationwide Mini-Finland Survey (Vehkalahti et al. 1991). The comparison was confined to those subjects who had taken part in the clinical oral examination.

The following indicators were used to measure changes: edentulousness, use of removable partial dentures, number of teeth, prevalence of caries and periodontitis, and the brushing of teeth and visits to the dentist. In addition to caries, the status of teeth was described by reference to the number of sound and filled teeth. All comparisons were made by age group and gender.

The criterion for adults with a large number of teeth was here set at 25 teeth, even though the WHO oral health goal for 2000 was at least 20 functional teeth (FDI 1982). However, in view of the situation achieved by the time of the Health 2000 Survey, that criterion was considered too low. The criterion applied for completely sound teeth was the absence of both caries and fillings. Filled teeth were defined as those that had a filling or prosthetic crown, but no caries.

Decayed teeth (DT) were defined as those in which the caries lesion extended to dentin. Fractured teeth or fillings were not counted as decayed teeth unless they exhibited caries. Root remnants were classified as decayed teeth only if they were carious. The occurrence of caries in population groups was described by statistics on the average number of decayed teeth (DT) and on the number of people with at least one decayed tooth ( $DT > 0$ ) as a percentage of all dentate subjects.

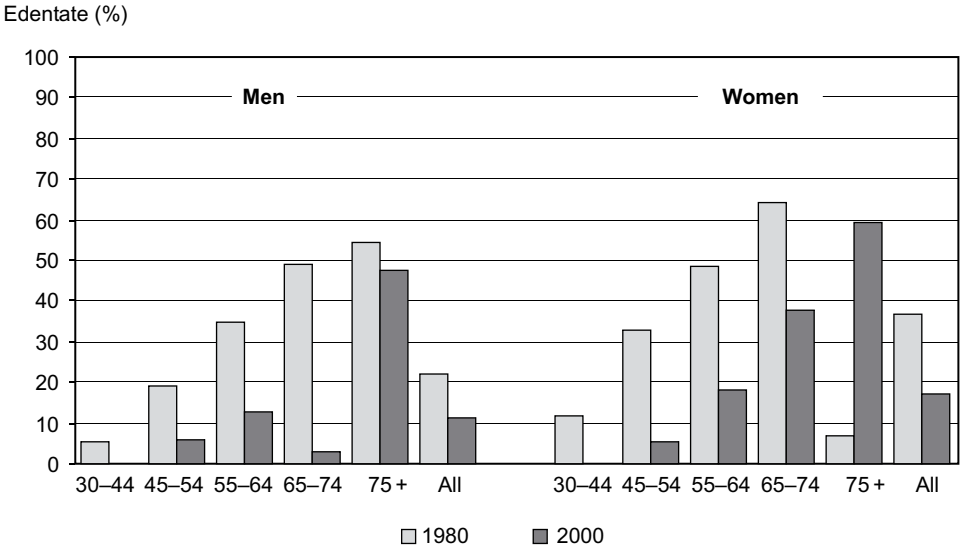
Periodontal status was described by the presence of deepened ( $\geq 4$  mm) periodontal pockets. In addition, periodontal pockets measuring 4–6 mm and more were recorded separately. All subjects with one or more teeth with a deepened periodontal pocket of  $\geq 4$  mm, were classified as having periodontitis and those with a periodontal pocket of  $\geq 6$  mm, as having the severe form of periodontitis.

# Results

## Edentulousness

The prevalence of edentulousness in 2000 was about half the level recorded in 1980: in women the figures were down to 17% from 37%, in men to 12% from 22%. The change was particularly noticeable among people of working age. Edentulousness had disappeared altogether in the age group 30–44, and among women aged 45–54 it had decreased to one-sixth and among men to one-third of the figures in 1980 (Figure 15.1).

**Figure 15.1. Edentulous adults as a percentage of the participants in the clinical oral examination by age group and gender in 1980 (n=7,190) and 2000 (n=6,316).**



## Removable partial dentures

The number of dentate subjects wearing removable partial dentures decreased in all age groups under 55, most noticeably so in the youngest people (Table 15.1). The opposite trend was observed in older dentate subjects aged 75 or over: here the corresponding figures increased considerably, and in 2000 the figure recorded for men was twice as high as in 1980.

With the exception of women aged 75 or over, dentate subjects were in the majority in all age groups. Furthermore, dentate subjects in 2000 had a greater number of teeth than 20 years earlier (Table 15.2.). In the age group 30–44, the average difference compared to the figures 20 years ago was 5–7 teeth, in all older age groups 4–5 teeth. The change was slightly more prominent in women than in men.

**Table 15.1. Prevalence (%) of removable partial dentures in dentate men and women by age group in 1980 (n=5,028) and 2000 (n=5,401).**

Survey		Age groups					
		All	30–44	45–54	55–64	65–74	75+
<b>Mini-Finland 1980</b>	Men	15	10	14	22	27	19
	Women	21	13	22	29	39	29
<b>Health 2000</b>	Men	12	1	11	23	32	39
	Women	14	2	11	24	37	39

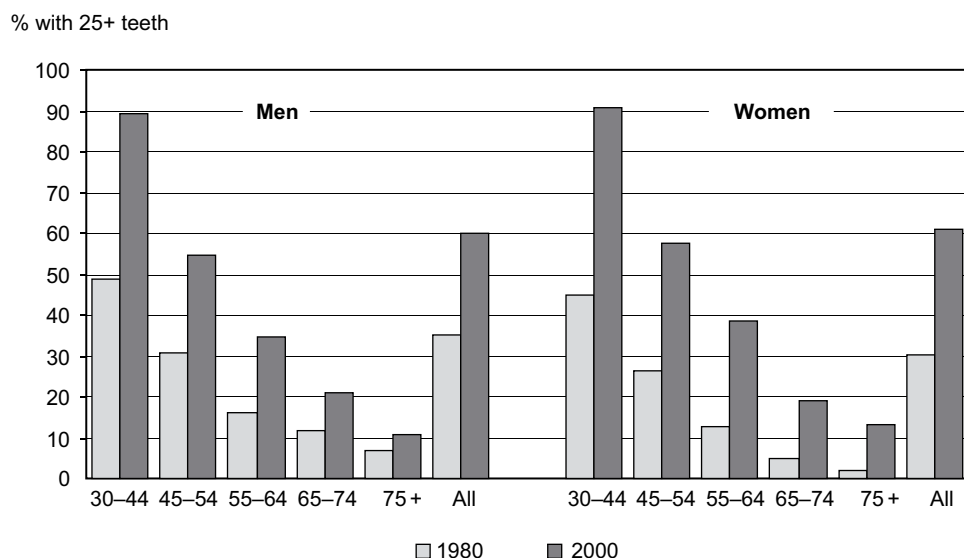
Number of teeth

**Table 15.2. Mean number of teeth in dentate adults by age group in 1980 (n=5,028) and 2000 (n=5,401).**

Survey	All	Age groups				
		30–34	35–44	45–54	55–64	65+
<b>Mini-Finland 1980</b>	18.2	22.8	20.3	17.8	14.6	11.0
<b>Health 2000</b>	22.9	28.3	27.1	22.7	19.0	15.3

In 2000, 60% of the dentate participants had at least 25 teeth, in the age group 34–44 the figure was 90%. In relative terms the change from 1980 was particularly noticeable among women: in the age group 55–64 the percentage was three times, in the age group 65–74 four times and in the age group 75+ five times that obtained 20 years earlier (Figure 15.2).

**Figure 15.2. Subjects with at least 25 teeth as a percentage of dentate women and men by age group in 1980 (n=5,028) and 2000 (n=5,389).**



## Number of sound teeth

In 2000, all dentate subjects had on average one more completely sound tooth than in 1980 (9.4 vs. 8.1). The difference compared to the situation in 1980 was most striking in the youngest age groups: in subjects aged 30–34 years 5.5 teeth (16.9 vs. 9.4) and in subjects aged 35–44 years 2.7 teeth (11.3 vs. 8.6). In both age groups the situation had improved more among women than among men.

## Number of filled teeth

In 2000 the average number of filled teeth was 12.4, compared to 8.2 in 1980. In the youngest age group (30–34 years) the average number of filled teeth was down by 1.1, in other age groups the number was up by 5–6 teeth. In 2000 the number of filled teeth in the age group 55–64 was twice as high and among the elderly three times as high as the averages recorded in 1980 (Table 15.3).

In 2000 women continued to have more filled teeth than men, but the gender differences were less pronounced than in 1980. In 1980, women aged 30–34 had on average 1.9 fewer filled teeth than men, in the age group 45–54 they had 3.3 fewer filled teeth than men. In 2000 the difference between women and men in the average number of filled teeth had been reduced to 0.2 in the age group 30–34, but was still 2.6 teeth in the age group 45–54.

**Table 15.3. Average number of filled (FT) and decayed teeth (DT) in dentate adults by age group in 1980 (n=5,028) and 2000 (n=5,389).**

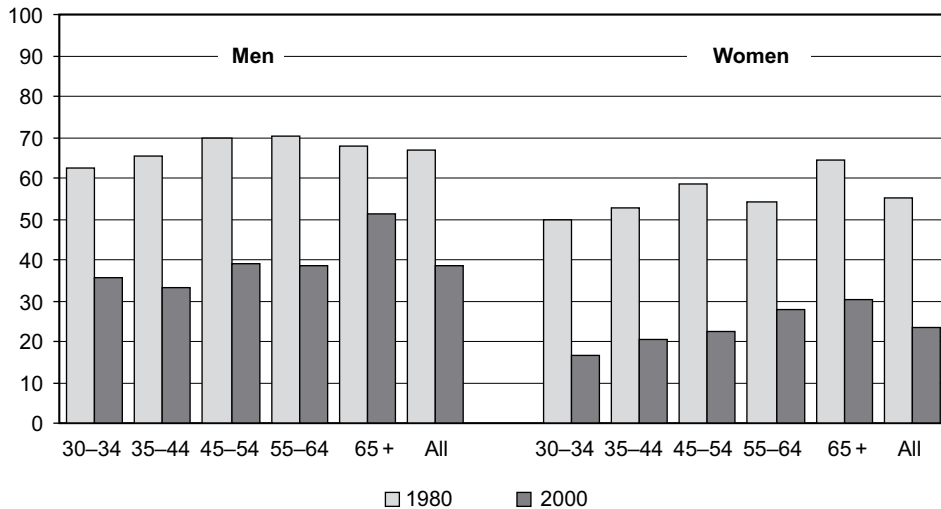
Survey		Age groups					
		All	30–34	35–44	45–54	55–64	65+
<b>Mini-Finland 1980</b>	FT	8.2	11.8	9.8	7.8	5.6	3.1
<b>Health 2000</b>	FT	12.4	10.6	14.9	13.3	11.1	8.9
<b>Mini-Finland 1980</b>	DT	2.5	2.5	2.6	2.6	2.2	2.5
<b>Health 2000</b>	DT	0.8	0.6	0.7	0.9	0.8	1.1

## Number of decayed teeth

In 2000 the average number of decayed teeth in the Finnish adult population was 0.8, about one-third of the figure recorded in 1980 (2.5). The decrease in caries was more or less equally distributed across all age groups (Table 15.3). In 2000 women had on average 0.5 and men 1.1 decayed teeth, in 1980 the averages were 1.9 and 3.1. Age group differences were marginal at both points of measurement, but the gender differences were very clear in all age groups: women had less decayed teeth than men.

In 2000 the prevalence of caries (DT>0) was about half of that recorded in 1980 (Figure 15.3.). The change was more pronounced among women than men, dropping from 55% in 1980 to 23% in 2000; the corresponding decrease among men was from 67% to 38%. By age group, the changes were roughly of the same magnitude except for the group of men aged 65 or over.

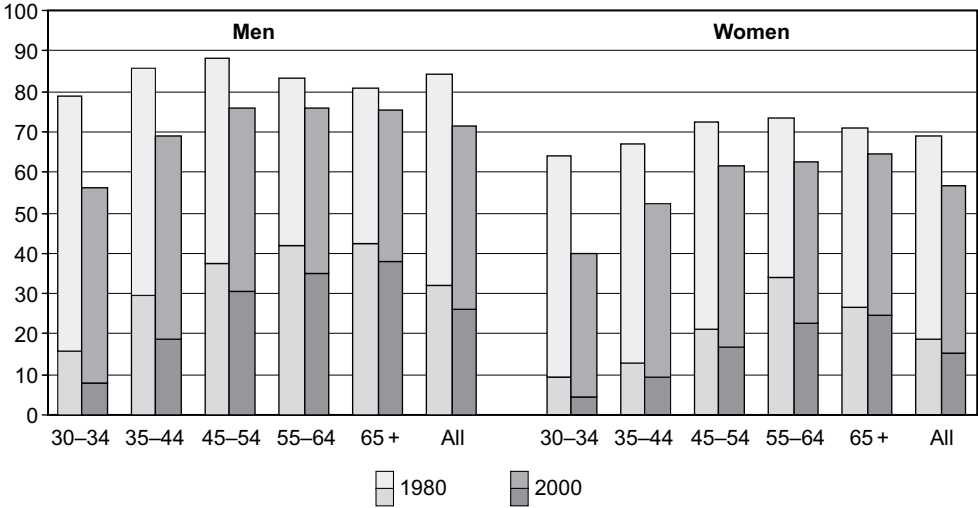
**Figure 15.3. Subjects with decayed teeth as a percentage of dentate women and men by age group in 1980 (n=5,028) and 2000 (n=5,389).**



### Periodontal status

A decrease in the prevalence of periodontitis from 1980 to 2000 appeared for both women and men, but at the population level the change was not as pronounced as those shown by other indicators of oral health. In 2000, 64% of dentate subjects had one or more teeth with a deepened periodontal pocket ( $\geq 4$  mm), 20 years earlier the corresponding figure was 77%. For women, the figure was down from 69% in 1980 to 57% in 2000, for men from 84% to 72%. The biggest changes were observed in the age group 30–34: among women from 63% to 40% and among men from 79% to 56%. The smallest changes were seen among the elderly, both women and men (Figure 15.4.).

**Figure 15.4. Subjects with deepened ( $\geq 4\text{mm}$ ) periodontal pockets as a percentage of dentate women and men in 1980 ( $n=4,777$ ) and 2000 ( $n=5,255$ ). Lower sections of the bars describe subjects who had at least one tooth with periodontal pocket of 6 mm or more in depth.**



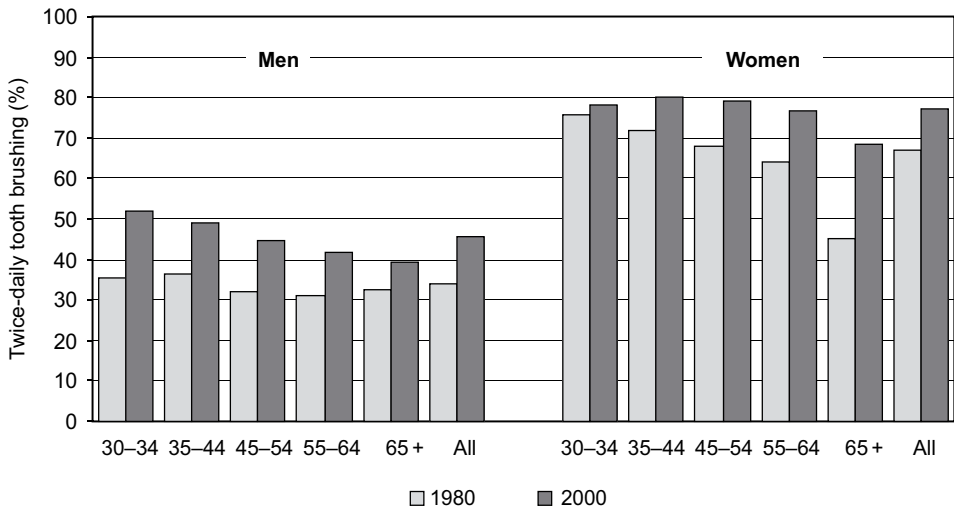
In 2000, the severe form of periodontitis was observed in 20% of dentate subjects, compared to 26% in 1980; among men the figures were 26% and 32%, among women 15% and 19%. The decrease was more or less equally distributed across all age groups, although the changes were somewhat more pronounced in men aged 35–44 and women aged 55–64 (Figure 15.4.).

**Frequency of tooth brushing**

In 2000, 77% of women and 46% of men brushed their teeth at least twice a day, compared to 67% of women and 34% of men in 1980 (Figure 15.5.). The most pronounced improvements were observed for women aged 65 or over (from 45% to 69%) and for men aged 30–34 (from 32% to 52%). Despite these favourable trends the average frequency of tooth brushing in all male age groups in 2000 was still clearly lower than in the corresponding female age groups in 1980. In a birth cohort analysis, it seems that tooth brushing habits have improved only marginally. In the birth cohort that in 1980 were aged 35–44, the proportion who brushed their teeth twice a day was only 5% greater in 2000 than in 1980. The figures increased by roughly similarly among women and men.



**Figure 15.5. Subjects who brush their teeth at least twice a day as a percentage of dentate women and men by age group in 1980 (n=5,028) and 2000 (n=5,389).**

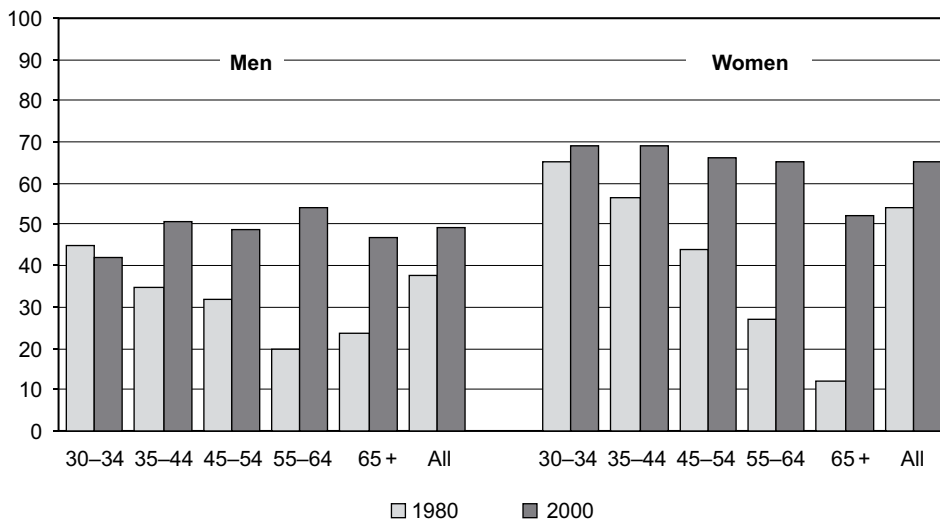


### Dental check-ups

In 2000 more than half of the dentate adults, 65% of women and 49% of men said they go to regular dental check-ups at least once in two years; the figures 20 years earlier were 54% for women and 38% for men (Figure 15.6). The biggest increase in dental check-ups was observed for those aged 55 or over, both for women and men. Changes were minor in the age group 30-34: a slight increase for women and a slight decrease for men.

A noticeable increase in annual dental check-ups was observed for all dentate aged 35 or over, the changes being the greater the older the subjects. Among those aged 55-64, 21% of women in 1980 but 54% in 2000 reported the habit of annual check-ups, for men the increase was from 13% to 46%. In the age group 30-34 the percentage of annual dental check-ups decreased slightly, for women from 43% in 1980 to 41% in 2000, for men from 25% to 23%.

**Figure 15.6. Dentate adults reporting a habit of going to dental check-ups once in two years, as a percentage of dentate women and men by age group in 1980 (n=5,028) and 2000 (n=5,389).**

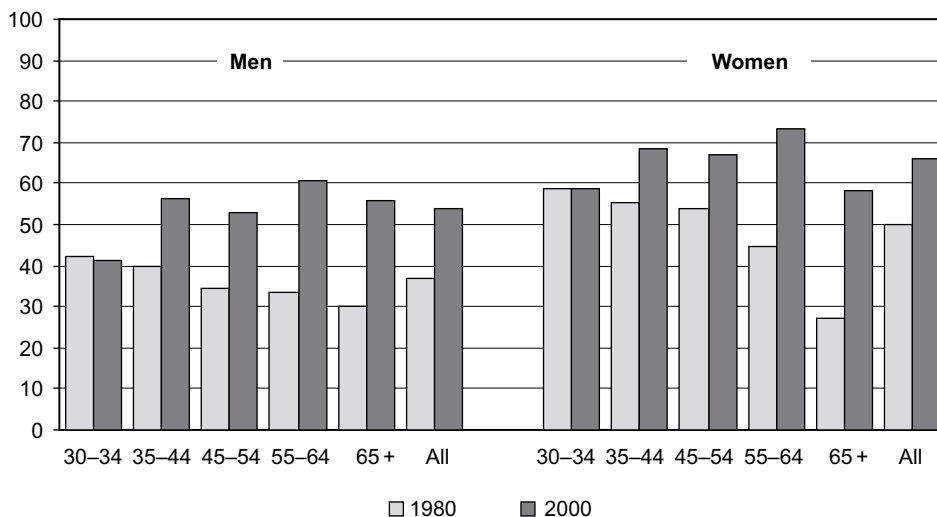


### Frequency of dental visits

In 2000, 52% of all participants (56% of women and 48% of men) in the oral health examination said they had seen a dentist during the past 12 months; the figures 20 years earlier were 32% for all, 34% for women and 30% for men. Visits to a dentist by edentulous subjects continued to remain infrequent, even though the percentage of edentulous people who reported having visited a dentist during the past 12 months had doubled from 1980 (7%) to 2000 (14%).

In 2000, 60% of dentate subjects (as compared to 43% in 1980) said they had visited a dentist during the past 12 months. The figures for men were 54% and 37% and for women 66% and 50%, respectively, indicating that the gender difference in dental visits has narrowed only marginally (Figure 15.7). The frequency of dental visits among dentate subjects aged 30–34 had remained unchanged, but in other age groups the figures showed a strong increase. Among women the biggest changes were recorded in the age group 65 or over, where the percentage in 2000 was more than twice the figure recorded in 1980. Among men the biggest changes were seen in the age groups over 65 and 55–64, where the percentages of those saying they had been to a dentist during the past 12 months almost doubled.

**Figure 15.7. Subjects who had visited a dentist during the past 12 months as a percentage of dentate women and men by age group in 1980 (n=5,028) and 2000 (n=5,389).**



### Number of dental visits

Among those dentate who had been to a dentist during the past 12 months, the number of dental visits in 2000 (2.6) was clearly lower than the corresponding figure (3.6) in 1980 (Table 15.4.). In 2000 these figures for men and women no longer differed from each other, whereas in 1980 women had made 1.4–0.9 more visits in different age groups.

**Table 15.4. Average number of dental visits by those dentate who visited a dentist during the past 12 months in 1980 (n=2,175) and 2000 (n=3,303).**

Survey	Age groups					
	All	30-34	35-44	45-54	55-64	65+
<b>Mini-Finland 1980</b>	3.6	3.4	3.7	3.7	3.8	3.3
<b>Health 2000</b>	2.6	2.6	2.5	2.7	2.5	2.6

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# APPENDICES

## Appendix 1. Appendix Tables

*Appendix Table 3.1. Distribution (%) of subjects by self-rated oral health in men (M) and women (W) by age group (n=7,087).*

Self-rated oral	Age group											
	All		30–44		45–54		55–64		65–74		75+	
	M	W	M	W	M	W	M	W	M	W	M	W
<b>All</b>												
Fairly good or good	61	68	68	75	59	70	58	68	56	57	50	57
Average	24	22	22	19	24	19	23	23	29	28	30	25
Fairly poor or poor	15	10	10	6	17	11	19	9	15	15	20	18
<b>Dentate</b>												
Fairly good or good	61	69	67	75	58	69	57	67	53	54	46	57
Average	24	21	22	19	24	19	23	24	32	29	28	21
Fairly poor or poor	15	10	11	6	18	12	20	9	15	17	26	22
<b>Edentulous</b>												
Fairly good or good	64	64	--	--	75	75	64	73	63	60	53	58
Average	23	24	--	--	15	16	24	17	23	28	31	27
Fairly poor or poor	13	12	--	--	10	9	12	10	14	12	16	15

-- less than 50 observations

*Appendix Table 3.2. Percentage of subjects who had experienced toothache or other problems related to teeth or dentures during the past 12 months by age and level of education in men(M) and women (W) (n=7,087).*

Level of education	Age group											
	All		30–44		45–54		55–64		65–74		75+	
	M	W	M	W	M	W	M	W	M	W	M	W
<b>All</b>	<b>30</b>	<b>33</b>	<b>32</b>	<b>39</b>	<b>29</b>	<b>34</b>	<b>33</b>	<b>32</b>	<b>27</b>	<b>28</b>	<b>26</b>	<b>21</b>
Basic	30	29	34	42	31	32	30	31	26	27	29	19
Intermediate	31	33	33	37	29	33	34	32	27	29	--	20
Higher	30	38	31	40	28	36	37	36	--	35	--	34

-- less than 50 observations

**Appendix Table 3.3. Percentage of subjects reporting oral health related problems (OHIP-14) occasionally or more often during the past month, by age and dental status (n=5,981).**

	Dentate						Edentulous					All						
	Age group						Age group					Age group						
	All	30-44	45-54	55-64	65-74	75 +	All	30-44	45-54	55-64	65-74	75 +	All	30-44	45-54	55-64	65-74	75 +
<b>Functional limitation</b>																		
Trouble pronouncing words	5	3	5	7	10	15	18	1	14	19	19	22	7	3	6	9	13	19
Worsened sense of taste	5	3	5	5	10	12	12	3	7	8	14	17	6	3	5	6	12	15
<b>Physical pain</b>																		
Painful aching	17	16	16	18	18	16	21	22	18	19	21	23	17	16	16	18	19	20
Uncomfortable eating food	16	11	16	21	24	24	37	10	30	40	40	42	19	11	17	24	30	35
<b>Psychological discomfort</b>																		
Been self-conscious	17	12	19	18	22	22	28	14	24	30	29	31	18	12	19	20	25	27
Feeling tense	9	7	9	9	13	13	15	9	12	18	14	18	10	7	9	10	13	16
<b>Physical disability</b>																		
Unsatisfactory diet	4	2	4	4	6	10	11	1	5	13	12	15	5	2	4	5	8	13
Interrupted meals	4	3	3	5	8	9	12	6	7	11	13	15	5	3	3	6	10	13
<b>Psychological disability</b>																		
Difficulty relaxing	4	4	4	4	5	8	8	4	4	6	11	10	5	4	4	4	7	9
Been embarrassed	7	6	7	7	9	13	11	10	7	13	10	12	7	6	7	8	9	12
<b>Social disability</b>																		
Irritability	3	3	3	3	4	5	6	6	3	6	6	7	4	3	3	4	5	6
Difficulty doing usual jobs	3	2	3	3	4	6	6	4	1	4	7	11	3	2	3	3	5	9
<b>Handicap</b>																		
Life in general less satisfying	7	5	8	7	11	10	11	7	12	13	10	13	8	5	8	8	10	12
Totally unable to function	1	1	1	1	1	2	2	1	1	1	3	4	1	1	1	1	2	3

**Appendix Table 4.1. Distribution (%) of tooth brushing by level of education and age group in men (M) and women (W) who according to the interview data were dentate (n=5,595).**

Level of education	Frequency of tooth brushing	Age group							
		All		30–44		45–64		65 +	
		M	W	M	W	M	W	M	W
All	Twice a day	45	76	50	80	44	78	38	66
	Once a day	41	22	39	19	42	21	43	28
	Less often	14	2	11	1	14	1	19	6
Basic	Twice a day	33	66	36	68	33	69	30	62
	Once a day	44	30	39	30	47	29	45	31
	Less often	23	4	25	2	20	2	25	7
Intermediate	Twice a day	44	78	44	79	43	77	47	72
	Once a day	44	21	45	20	43	22	41	25
	Less often	12	1	11	1	14	1	12	3
Higher	Twice a day	64	85	67	83	61	88	59	78
	Once a day	32	15	29	16	35	12	36	22
	Less often	4	< 1	4	1	4	0	5	0

**Appendix Table 4.2. Distribution (%) of cleaning removable denture by level of education and age group in men (M) and women (W) who according to interview data had removable dentures (n=2,414). Data for age group 30–44 not presented separately, but included under the category “All”.**

Level of education	Frequency of cleaning dentures	Age group							
		All		45–54		55–64		65 +	
		M	W	M	W	M	W	M	W
All	Twice a day	47	71	41	75	52	74	48	69
	Once a day	44	26	49	22	40	23	43	28
	Less often	9	3	10	3	8	3	9	3
Basic	Twice a day	43	69	35	69	47	73	45	68
	Once a day	46	28	54	29	43	23	44	30
	Less often	11	3	11	2	10	4	11	2
Intermediate	Twice a day	52	74	45	82	58	71	56	71
	Once a day	42	24	48	15	36	29	42	26
	Less often	6	2	7	3	6	0	2	3
Higher	Twice a day	64	82	--	--	--	--	--	80
	Once a day	31	14	--	--	--	--	--	15
	Less often	5	4	--	--	--	--	--	5

-- less than 50 observations



**Appendix Table 4.3. Distribution (%) of consumption of sweet snacks in men (M) and women (W) by age group and type of snack. Dataset: dentate questionnaire respondents (n=5,288).**

Type of snack	Frequency	Age group							
		All		30-44		45-64		65+	
		M	W	M	W	M	W	M	W
Coffee or tea with sugar	More than 2 / day	30	14	37	15	28	13	17	12
	1-2 / day	24	20	19	15	23	19	44	41
	2-5 / week	5	5	5	5	6	4	3	4
	Less often	14	15	13	16	14	15	14	11
	Not at all	27	46	26	49	29	49	22	32
Sugar-containing juices, fizzy drinks or cocoa	More than 2 / day	6	3	7	3	5	2	5	1
	1-2 / day	17	11	21	12	14	9	14	13
	2-5 / week	30	24	35	31	28	21	20	17
	Less often	39	50	34	48	43	54	43	45
	Not at all	8	12	3	6	10	14	18	24
Chewing gum with xylitol	More than 2 / day	4	7	6	10	3	6	2	2
	1-2 / day	7	12	10	17	6	11	< 1	3
	2-5 / week	18	23	25	32	14	20	6	9
	Less often	43	32	46	33	45	35	28	21
	Not at all	28	26	13	8	32	28	64	65
Lozenges and sweets with xylitol	More than 2 / day	2	3	2	4	2	2	2	1
	1-2 / day	5	4	4	4	4	4	4	5
	2-5 / week	20	19	25	23	17	17	16	16
	Less often	62	63	63	64	64	66	52	51
	Not at all	11	11	6	5	13	11	26	27
Chocolate or filled biscuits	More than 2 / day	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
	1-2 / day	3	3	2	3	2	2	5	3
	2-5 / week	26	32	35	47	22	25	18	18
	Less often	64	59	59	48	69	66	63	65
	Not at all	7	6	4	2	7	7	14	14
Lozenges and sweets without xylitol	More than 2 / day	1	1	1	1	1	1	1	< 1
	1-2 / day	2	2	2	1	2	2	5	2
	2-5 / week	13	11	17	15	10	8	9	7
	Less often	67	66	70	71	68	68	51	51
	Not at all	17	20	10	12	19	21	34	40
Toffee or liquorice or e.g. raisins	More than 2 / day	0	< 1	< 1	0	< 1	0	1	1
	1-2 / day	2	1	1	< 1	2	1	3	1
	2-5 / week	12	11	16	13	9	10	9	9
	Less often	73	78	75	80	74	79	62	66
	Not at all	13	10	8	6	14	10	25	23
Chewing gum without xylitol	More than 2 / day	< 1	< 1	< 1	< 1	0	< 1	1	< 1
	1-2 / day	< 1	< 1	< 1	1	1	< 1	< 1	0
	2-5 / week	2	2	3	2	1	1	< 1	< 1
	Less often	42	29	51	32	39	33	21	12
	Not at all	56	69	46	65	59	66	78	88

**Appendix Table 5.1. Distribution (%) of subjects by time since the most recent reported visit to a dentist by age group in all (n=7,087), dentate (n=5,656) and edentulous (n=1,420) men (M) and women (W).**

	Age group											
	All		30–44		45–54		55–64		65–74		75 +	
	M	W	M	W	M	W	M	W	M	W	M	W
<b>All</b>												
< 1 year	48	56	51	65	50	64	53	60	37	41	33	27
1–2 years	17	16	22	22	17	15	12	13	14	14	12	11
3–5 years	15	10	17	10	15	11	13	9	13	9	12	9
> 5 years	20	18	10	3	19	9	22	18	35	37	43	52
<b>Dentate</b>												
< 1 year	54	66	52	65	53	67	60	73	54	64	59	56
1–2 years	18	18	21	22	18	16	13	14	16	19	12	16
3–5 years	15	9	17	11	15	11	13	7	13	6	13	9
> 5 years	13	6	10	3	15	6	14	7	16	11	16	18
<b>Edentulous</b>												
< 1 year	15	16	--	--	24	35	18	10	5	10	12	10
1–2 years	18	18	21	22	18	16	13	14	16	19	12	16
3–5 years	13	12	--	--	14	17	15	17	13	13	11	10
> 5 years	61	63	--	--	55	39	61	62	72	71	65	72

-- less than 50 observations

**Appendix Table 5.2. Average number of visits to a dentist during the past 12 months<sup>1</sup> divided by all subjects (n = 7,087).**

	Age group					
	All	30–44	45–54	55–64	65–74	75+
<b>All<sup>1</sup></b>	1.3	1.5	1.5	1.4	1.0	0.7
Men	1.2	1.3	1.2	1.4	1.0	0.9
Women	1.4	1.7	1.8	1.5	1.0	0.6
<b>Public sector dentist</b>	0.4	0.7	0.3	0.3	0.3	0.2
Men	0.4	0.6	0.3	0.4	0.3	0.3
Women	0.5	0.8	0.4	0.3	0.3	0.2
<b>Private dentist</b>	0.9	0.7	1.2	1.1	0.7	0.4
Men	0.8	0.6	0.9	1.0	0.7	0.5
Women	0.9	0.8	1.4	1.1	0.7	0.4

<sup>1</sup> Public sector, private or other dentist

**Appendix Table 5.3. Reported treatments received (%) during the most recent treatment course by dentate subjects having visited a public sector dentist or a private dentist by age group (n=5,595).**

Treatment	Age group							
	All		30–44		45–64		65+	
	Public	Private	Public	Private	Public	Private	Public	Private
<b>Examinations and diagnosis</b>								
Clinical oral I examination	85	91	87	91	81	91	86	89
Radiography	39	33	43	39	36	31	35	26
<b>Preventive care</b>								
Instructions how to brush teeth	7	7	7	7	6	7	8	5
Dietary counselling	2	2	2	3	1	2	1	1
Advice on use of fluoride	3	3	3	4	2	2	2	2
Polishing or scaling	61	75	60	74	60	76	70	72
Fluoride varnish or other fluoride treatment	33	39	40	50	27	37	25	26
<b>Restorative care</b>								
Filling therapy	66	64	66	64	70	63	57	64
Root canal treatment	15	12	15	12	17	13	13	12
<b>Surgery</b>								
Extraction of a tooth or a root	13	9	12	7	13	8	20	15
Intraoral surgery	2	2	2	2	2	2	2	4
Treatment of temporomandibular disorders	1	1	2	2	<1	1	0	0
<b>Prosthetic care</b>								
Preparation or repair of a crown or a bridge	6	8	4	6	7	8	8	9
Preparation or repair of removable dentures	4	5	< 1	1	7	4	15	14

**Appendix Table 6.1. Percentage of edentulous subjects (%) among men (M) and women (W) by age, level of education and university hospital district (n=6,719).**

	Age group											
	All		30–44		45–54		55–64		65–74		75+	
	M	W	M	W	M	W	M	W	M	W	M	W
<b>All</b>	<b>11</b>	<b>17</b>	<b>&lt; 1</b>	<b>&lt; 1</b>	<b>6</b>	<b>6</b>	<b>13</b>	<b>18</b>	<b>32</b>	<b>39</b>	<b>50</b>	<b>60</b>
<b>Level of education</b>												
Basic	24	34	2	0	13	9	21	26	38	46	57	67
Intermediate	5	10	< 1	< 1	3	6	9	17	24	28	37	47
Higher	1	2	0	0	1	2	1	2	6	6	17	23
<b>University hospital district</b>												
Helsinki	7	12	0	0	3	3	7	8	22	31	47	50
Turku	10	13	0	0	9	5	7	15	28	26	52	45
Tampere	13	19	< 1	0	10	6	15	22	35	37	46	63
Kuopio	13	22	1	0	4	8	21	21	36	45	43	66
Oulu	16	28	2	1	8	9	20	38	48	60	70	83

**Appendix Table 7.1. Mean numbers of sound teeth, filled teeth and teeth requiring treatment in dentate men (M) and women (W) by age group and level of education (n=5,389).**

Status of teeth and level of education	Age group											
	All		30–34		35–44		45–54		55–64		65 +	
	M	W	M	W	M	W	M	W	M	W	M	W
<b>Sound</b>												
<b>All</b>	<b>10.0</b>	<b>8.9</b>	<b>16.9</b>	<b>16.9</b>	<b>11.7</b>	<b>11.0</b>	<b>8.9</b>	<b>7.5</b>	<b>7.7</b>	<b>6.1</b>	<b>5.6</b>	<b>4.7</b>
Basic	7.9	6.3	16.0	15.0	9.6	9.2	8.0	6.7	7.6	5.5	5.4	4.6
Intermediate	10.7	9.4	16.6	16.5	11.5	10.8	9.1	7.3	7.7	6.5	5.9	5.0
Higher	11.6	10.9	17.7	17.4	13.2	11.7	9.6	8.4	7.7	6.7	6.0	5.5
<b>Filled teeth</b>												
<b>All</b>	<b>11.6</b>	<b>13.1</b>	<b>10.5</b>	<b>10.8</b>	<b>14.4</b>	<b>15.4</b>	<b>12.0</b>	<b>14.6</b>	<b>9.9</b>	<b>12.3</b>	<b>8.3</b>	<b>9.5</b>
Basic	8.8	10.7	10.6	11.5	13.1	14.2	9.4	12.4	7.7	10.4	6.6	8.2
Intermediate	12.3	13.6	10.7	11.0	14.5	15.6	12.3	14.3	9.8	13.4	10.6	9.8
Higher	13.8	14.7	10.1	10.6	15.1	15.5	15.0	16.7	14.0	15.0	12.7	14.1
<b>Teeth requiring treatment</b>												
<b>All</b>	<b>1.4</b>	<b>0.7</b>	<b>1.1</b>	<b>0.4</b>	<b>1.3</b>	<b>0.6</b>	<b>1.5</b>	<b>0.8</b>	<b>1.3</b>	<b>0.7</b>	<b>1.7</b>	<b>0.9</b>
Basic	1.8	0.9	1.3	1.4	2.0	1.2	1.9	0.9	1.5	0.7	1.9	1.0
Intermediate	1.5	0.7	1.4	0.6	1.4	0.7	1.5	0.9	1.4	0.7	1.5	0.8
Higher	0.8	0.5	0.7	0.2	0.6	0.4	0.9	0.7	0.8	0.8	1.3	0.8

**Appendix Table 7.2. Distribution (%) of dentate subjects (n=5,389) according to number of sound teeth, by age group and gender.**

Categories by number of sound teeth	Age group					
	All	30–34	35–44	45–54	55–64	65+
<b>All</b>						
0	5	0	2	6	11	19
1–9	47	10	40	60	64	66
10–17	33	44	41	29	22	14
18–32	15	46	17	5	4	1
<b>Women</b>						
0	7	0	2	6	9	19
1–9	54	8	42	66	73	69
10–17	28	47	40	24	16	11
18–32	11	45	16	4	2	1
<b>Men</b>						
0	7	0	2	6	12	17
1–9	45	12	38	53	55	64
10–17	34	40	42	34	28	17
18–32	14	48	18	7	5	2

**Appendix Table 12.1. Percentage of men (M) and women (W) with different types of removable dentures among subjects participating in the clinical oral examination or the home health examination (n=6,727).**

Type of dentures in upper / lower jaws	Age group											
	All		30–44		45–54		55–64		65–74		75+	
	M	W	M	W	M	W	M	W	M	W	M	W
Full / Full	10	16	1	< 1	6	5	11	18	29	37	42	52
Full / Partial	4	5	0	1	3	3	8	10	8	11	9	7
Full / –	8	7	1	1	10	10	14	12	9	11	13	10
Partial / Partial	1	2	0	<1	1	2	3	3	3	3	4	1
Partial / –	5	4	1	1	6	5	7	5	9	6	4	5
– / Partial	1	1	< 1	< 1	< 1	1	1	1	1	2	< 1	2
Others	< 1	< 1	0	0	< 1	< 1	< 1	< 1	< 1	< 1	1	1
<b>No removable dentures</b>	<b>72</b>	<b>65</b>	<b>97</b>	<b>97</b>	<b>74</b>	<b>74</b>	<b>56</b>	<b>51</b>	<b>41</b>	<b>30</b>	<b>27</b>	<b>22</b>

**Appendix Table. 12.2. Percentage of subjects with different types of removable dentures among subjects participating in the clinical oral examination and the home health examination (n=6,727).**

	Age group					
	All	30–44	45–54	55–64	65–74	75+
<b>No removable dentures</b>	<b>68</b>	<b>97</b>	<b>74</b>	<b>54</b>	<b>35</b>	<b>24</b>
<b>Full denture</b>						
Upper jaw, lower jaw or both	25	1	19	36	53	68
Upper jaw	25	1	19	36	53	67
Upper jaw only <sup>1</sup>	7	1	10	12	10	11
Lower jaw	13	< 1	6	15	34	50
Lower jaw only <sup>1</sup>	< 1	0	< 1	< 1	< 1	< 1
Both jaws	13	< 1	6	15	33	49
<b>Partial denture</b>						
Upper jaw, lower jaw or both	11	2	10	19	22	16
Upper jaw	6	1	6	9	11	8
Upper jaw only <sup>1</sup>	4	1	5	6	7	5
Lower jaw	7	1	5	13	14	11
Lower jaw only <sup>1</sup>	1	< 1	1	1	2	1
Both jaws	2	< 1	1	3	3	2
<b>Full denture in upper jaw and partial denture in lower jaw</b>	<b>4</b>	<b>&lt;1</b>	<b>3</b>	<b>9</b>	<b>10</b>	<b>8</b>
<b>Partial denture in upper jaw and full denture in lower jaw</b>	<b>&lt; 1</b>	<b>0</b>	<b>&lt; 1</b>	<b>&lt; 1</b>	<b>&lt; 1</b>	<b>1</b>

<sup>1</sup> No removable denture in opposing jaw.

## **Appendix 2. List of publications based on the oral health data of the Health 2000 Survey**

### **Original articles in peer-reviewed scientific journals:**

#### **In 2004**

Savolainen J, Knuuttila M, Suominen-Taipale L, Martelin T, Nordblad A, Niskanen M, Uutela A. A strong sense of coherence promotes regular dental attendance in adults. *Community Dental Health* 2004;21(4):271-276.

#### **In 2005**

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. *European Journal of Oral Sciences* 2005;113(2):121-127.

Savolainen J, Suominen-Taipale AL, Uutela A, Martelin T, Niskanen M, Knuuttila M. Sence of coherence as a determinant of tooth-brushing frequency and level of oral hygiene. *Journal of Periodontology* 2005;76(6):1006-1012.

#### **In 2006**

Mettovaara H-L, Suominen-Taipale AL, Uutela A, Martelin T, Knuuttila MLE. Cynical hostility as a determinant of tooth brushing frequency and oral hygiene. *Journal of Clinical Periodontology* 2006;33(1):21-28.

Rutkiewics T, Könönen M, Suominen-Taipale L, Nordblad A, Alanen P. Occurrence of clinical signs of temporomandibular disorders in adult Finns. *Journal of Orofacial Pain* 2006;20(3):208-217.

#### **In 2007**

Könönen E, Paju S, Pussinen PJ, Hyvönen M, Di Tella P, Suominen-Taipale L, Knuuttila M. A Population-based Study on Salivary Carriage of Periodontal Pathogens in Adults. *Journal of Clinical Microbiology* 2007;45(8):2446-2451.

Lahti S, Vehkalahti MM, Nordblad A, Hausen H. Dental fear among populationaged 30 years and older in Finland. *Acta Odontologica Scandinavica* 2007;65(2):97-102.

Pohjola V, Lahti S, Vehkalahti MM, Tolvanen M, Hausen H. Association between dental fear and dental attendance among adults in Finland. *Acta Odontologica Scandinavica* 2007;65(4):224-230.

Syrjälä AM, Ylöstalo P, Sulkava R, Knuuttila M. Relationship between cognitive impairment and oral health: results of the Health 2000 Health Examination Survey in Finland. *Acta Odontologica Scandinavica* 2007;65(2):103-108.

## **In 2008**

- Lahti S, Suominen-Taipale AL, Hausen H. Oral health impacts among adults in Finland: Competing effects of age, number of teeth and removable dentures. *European Journal of Oral Sciences* 2008;116(3):260-266.
- Pohjola V, Lahti S, Tolvanen M, Hausen H. Dental fear and oral health habits among adults in Finland. *Acta Odontologica Scandinavica* 2008;66(3):148-153.
- Pohjola V, Lahti S, Vehkalahti M, Tolvanen M, Hausen H. Age-specific associations between dental fear and dental condition among adults in Finland. *Acta Odontologica Scandinavica* 2008;(8):1-8.
- Saxlin T, Suominen-Taipale L, Kattainen A, Marniemi J, Knuuttila M, Ylöstalo P. The association between serum lipid levels and periodontal infection. *Journal of Clinical Periodontology* 2008; in press.
- Ylöstalo P, Suominen-Taipale AL, Reunanen A, Knuuttila M. The association between body weight and periodontal infection. *Journal of Clinical Periodontology* 2008;35(4):297-304.

## **Articles in peer-reviewed scientific edited volumes:**

- Suominen-Taipale AL, Nordblad A, Arinen SS. Dental attendance in relation to aspects of need in the adult Finnish population. Spec. Ed. *Dental Public Health. Zeitschrift fur Gesundheitswissenschaften (Journal of Public Health)*. 2003;11(5):7-19.

## **Reviews in peer-reviewed scientific journals:**

- Vehkalahti M, Knuuttila M. Ikääntyneiden suunterveyden edistäminen Suomessa (Oral health promotion in the elderly in Finland). *Suomen Hammaslääkärilehti (The Finnish Dental Journal)* 2008;15(4):48-56.
- Vehkalahti M, Knuuttila M. Förebyggande vård främjar äldres munhälsa. Finland vill flytta focus från reparativ vård till profylax (Oral health promotion in the elderly in Finland). *Norske Tannelegeförenings Tidene* 2008;118(1):110-117.
- Vehkalahti M, Knuuttila M. Förebyggande vård främjar äldres munhälsa. Dags att flytta fokus från reparativ vård till profylax (Oral health promotion in the elderly in Finland). *Tandläkartidningen (Swedish Dental Journal)* 2008;100(2):70-77.
- Vehkalahti M, Knuuttila M. Förebyggande vård främjar äldres munhälsa. Finland vill flytta focus från reparativ vård till profylax (Oral health promotion in the elderly in Finland). *Tandlaegebladet* 2008;112(2):142-152.

## **Publications in Finnish scientific compilation works and Institutional series:**

- Nordblad A, Vehkalahti M ja suunterveyden työryhmä. Suun terveydentila. In: Aromaa A, Koskinen S, ed. *Terveys ja toimintakyky Suomessa. Terveys 2000*



- tutkimuksen perustulokset (Abstract in English). Kansanterveyslaitoksen julkaisuja B3/2002, Helsinki 2002. <http://www.ktl.fi/publications/2002/b3.pdf>
- Nordblad A, Vehkalahti M and the working group for oral health. Oral Health. In: Aromaa A, Koskinen S, ed. Health and Functional Capacity in Finland. Baseline Results of the Health 2000 Health Examination Survey. Publications of the National Public Health Institute B12/2004, Helsinki 2004. <http://www.terveys2000.fi/julkaisut/baseline.pdf>
- Suominen-Taipale L, Nordblad A, Vehkalahti M, Aromaa A, eds. Suomalaisten aikuisten suunterveys. Terveys 2000 -tutkimus (Abstract in English). Kansanterveyslaitoksen julkaisuja B16/2004. [http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2004b16.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2004b16.pdf)
- Vehkalahti M, Nordblad A, Suominen-Taipale L, Arinen S, Hallikainen D, Hausen H, Knuutila M, Söderholm A-L, Varsio S, Soikkonen K, Könönen M, Pietilä T. Suun ja hampaiden tutkimus. In: Heistaro S, ed. Menetelmäraportti. Terveys 2000 -tutkimuksen toteutus, aineisto ja menetelmät (Abstract in English). Kansanterveyslaitoksen julkaisuja B6/2005. [http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2005/2005b6.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2005/2005b6.pdf)
- Suominen-Taipale L, Vehkalahti M, Nordblad A ja suunterveyden työryhmä. Suunterveys ja suunhoitotavat. In: Koskinen S, Kestilä L, Martelin T, Aromaa A, ed. Nuorten aikuisten terveys. Terveys 2000 -tutkimuksen perustuloksia 18–29-vuotiaiden terveydestä ja siihen liittyvistä tekijöistä (Abstract in English). Kansanterveyslaitoksen julkaisuja B7/2005. Helsinki 2005. [http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2005/2005b7.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2005/2005b7.pdf)
- Suominen-Taipale L, Nordblad A, Vehkalahti M, Arinen S. Hammashoitopalvelut. in: Häkkinen U, Alha P, ed. Terveyspalvelujen käyttö ja sen väestöryhmittäiset erot. Terveys 2000 -tutkimus (Abstract in English). Kansanterveyslaitoksen julkaisuja B 10/2006. Helsinki 2006. [http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2006/2006b10.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2006/2006b10.pdf)
- Vehkalahti M, Paalanen L. Makeat välipalat. In: Prättälä R, Paalanen L, ed. Elintavat ja niiden väestöryhmäerot Suomessa. Terveys 2000 -tutkimus (Abstract in English). Kansanterveyslaitoksen julkaisuja B 2/2007. Helsinki 2007. [http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja\\_b/2007/2007b02.pdf](http://www.ktl.fi/attachments/suomi/julkaisut/julkaisusarja_b/2007/2007b02.pdf)

### **Doctoral thesis**

- Savolainen J. A salutogenic perspective to oral health. Sence of coherence as a determinant of oral and general health behaviours, and oral health-related quality of life. Thesis. University of Oulu, Acta Universitatis Ouluensis D Medica 851, Oulu 2005. <http://herkules.oulu.fi/isbn951427881X/>

