

Changing Dentate Status of Adults, Use of Dental Health Services, and Achievement of National Dental Health Goals in Denmark by the Year 2000

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Abstract

Objectives: This study analyzes the current profile of dentate status and use of dental health services among adults in Denmark at the turn of the millennium, assesses the impact on dentate status of sociodemographic factors and use of dental health services in adulthood and in childhood, and highlights the changes over time in dental health conditions among adults. Finally, the intention of the study was to evaluate the Danish dental health care system's level of achievement of the official goals for the year 2000 as formulated by the World Health Organization and the National Board of Health. The subjects of this study included a national representative sample of 16,690 Danish citizens aged 16 years and older (response rate=74.2%). A subsample (n=3,818) took part in a survey of dental care habits in childhood and prevalence of removable dentures; 66 percent of persons selected responded. **Methods:** Personal interviews were used to collect information on dentate status, use of dental health services and living conditions; data on dental care habits in childhood and prevalence of removable dentures were collected by self-administered questionnaires. **Results:** In all, 8 percent of interviewed persons were edentulous, while 80 percent had 20 or more natural teeth. At age 65–74 years, 27 percent were edentulous and 40 percent had 20 teeth or more; 58 percent wore removable dentures. Dentate status and prevalence of dentures were highly related to educational background and income, particularly for older age groups. Among persons interviewed, 80 percent paid regular dental visits and visits were most frequent among persons of high education and income. At age 35–44 years 95 percent had participated in regular dental care in childhood compared to 49 percent of 65–74-year-olds. Multivariate analyses revealed that sociobehavioral factors had significant effects on dentate status. **Conclusions:** Compared to similar studies carried out in 1987 and 1994, the present survey indicates a positive trend of improved dentate status in adult Danes in general and regular use of dental health services increased considerably over time. The WHO goals for better dental health by the year 2000 were achieved for 35–44-year-olds, whereas the goal of more people with functional dentitions at age 65 years or older was not achieved. It remains a challenge to the Danish dental health system to help even out the social inequalities in dental health. [*J Public Health Dent* 2004;64(3):127-35]

Key Words: oral health, dental health services, social inequity.

Globally, the prevalence of oral diseases has undergone dramatic changes in recent decades. In Western industrial societies, changes in the disease panorama have been documented primarily for the child population. It has been demonstrated that

growing proportions of children and adolescents are caries free, and that the caries experience has declined systematically over time (1,2). In relation to adults, evidence has accumulated on reductions in prevalence rates of edentulousness, and more individuals now

preserve their natural teeth and maintain functional dentitions (2-8).

Like other Scandinavian countries, Denmark has a tradition of several decades of community-oriented preventive oral care programs, particularly in relation to the child population. The Danish Municipal Dental Health Service is a school-based program, first established in 1910 in urban centers, while rural areas were covered somewhat later. The program now includes comprehensive clinical oral care, prevention, and oral health education for children and parents. The school-based activities encompass school oral health education in the classroom, diet control, supervised oral hygiene instructions, fissure sealing of permanent molars, and effective use of fluorides (9). Only fluoridated toothpaste is available on the market. A population-based oral health information system was established as part of the program to monitor the oral health status of children and to assist in planning and evaluation of services.

Information derived from the municipal dental health service epidemiologic register (SCOR) shows improvement in dental health among children and adolescents occurred primarily in the late 1970s and up through the 1980s (10), concurrent with the introduction of population-oriented preventive programs (9). Increased control of dental caries has been observed among children and adolescents of varying social and economic backgrounds and across regional or geographical boundaries. The changes in dental disease patterns in the child population reflect systematic efforts made by the municipal dental health services as regards out-

reach service, prevention, and curative dental care (10). Historically, the school dental service marked the start of preventive dental care for children. The introduction of the Act on Child Dental Care (11) in 1972 and on Dental Health Care (12) in 1986 ensured the continued expansion of a public health program within the frame of primary health care. Today, municipal dental health services cover almost 100 percent of the target group of children and adolescents.

Dental health care for adults is offered by private dental practitioners. The adults are responsible for a substantial part of the payments; however, some of the payments, in particular the curative services, are covered by the National Health Insurance Scheme. Epidemiologic and health sociological studies undertaken in Denmark in the late 1970s and in the 1980s demonstrated a high prevalence of oral disease in the adult Danish population, and significant social differences were seen in the distribution of both caries and periodontal diseases (13,14). The greatest social disparity, however, has been shown with regard to dentate status and the prevalence of removable dentures (15,17). Furthermore, it was established that material living and working conditions, combined with the structure and function of the dental care system, greatly affect the dental visiting habits of the adult population (13,14).

Population studies from the 1990s have indicated positive trends in dentate status of the adult population and the use of dental services (17). Meanwhile, persons reporting that they did not make use of existing private dental services had relatively poor dentate status (17). Dental care habits as well as dental health status are reported to be poorer in older age groups and among the socially and economically disadvantaged population groups, and some of the country's municipalities thus have supplemented their programs by providing preventive and curative public services to these target groups (18,20). Additionally, the adult dental care system has undergone changes in recent years and ever-increasing importance is attached to preventive dental care (21). Notably, the introduction in 1988 of preventive oral care under the National Health Insurance Scheme provided the basis for risk-oriented intervention and indi-

vidual instruction in oral self-care.

As opposed to the situation for children and adolescents, no population-based disease register has been established for monitoring the oral health status of the adult population. A continuous overview of health conditions must therefore be made on the basis of regular studies of representative population samples. In 1987 the Danish National Institute of Public Health conducted the first countrywide study of health and morbidity, which also included information on dentate status and use of dental health services (22). The dental health study was followed up in 1994 (17,23) and in 2000 (24), in collaboration with the Copenhagen School of Dentistry. In 2000 the standard dental health indicators were supplemented with questions on the prevalence of removable dentures, participation in school/child dental care as well as oral hygiene habits. The results concerning oral hygiene habits are reported separately (25).

The purpose of this study was to describe the current profile of dentate status and use of dental health services among adults in Denmark at the turn of the millennium. The study also aims to analyze the impact of sociodemographic factors on dental health, to assess the effects on dentate status of regular dental care in adulthood and in childhood, and to highlight the changes over time in dental health conditions among adults. Finally, it is the intention of this study to evaluate the Danish dental health care system's level of achievement of the official targets and goals for the year 2000 as formulated by the World Health Organization (26,27) and the National Board of Health (28).

Methods

The study is based on a national sample comprising 22,486 Danish citizens 16 years of age and older (24,29). Data were collected through personal interviews administered in three rounds of home visits in 2000 (February, May, and September). The overall rate of participation in the interview study was 74.2 percent ($n=16,690$), as 22.4 percent declined to participate, 1.3 percent were unable to participate due to illness or handicap, 0.2 percent were away or in hospital, 1.2 percent were not at home, 0.2 percent had moved to another locality, and 0.4 percent gave other reasons for nonpartici-

pation.

The data collection was implemented under management of the Danish National Institute of Social Research and carried out by its permanent corps of interviewers. The highly structured interview form focused on the following dimensions: (1) self-assessment of health, (2) morbidity, (3) consequences of morbidity, (4) illness behavior, (5) health behavior, (6) external health risks and resources, as well as (7) sociodemographic background information. The interview form also included the following dental health variables: self-assessment of dentate status, and dental visiting habits during the past five years. The personal interview was supplemented by a self-administered questionnaire handed out to participants upon conclusion of the interview. This questionnaire included dental health questions and was developed for a nationally representative random sample of those interviewed. This random sample comprised 5,802 people and a total of 3,818 persons responded (66%). The dental health variables in the self-administered questionnaire were: participation in school/child dental services or other private regular dental care during childhood, prevalence of removable dentures (partial/full), oral hygiene habits, and denture hygiene. The questions in both the interview form and the self-administered questionnaire were pretested, and the interviewers were carefully instructed in the administration of the forms prior to data collection. An introductory letter to the selected respondents described the study's scope and purpose, and assured full anonymity in connection with publication results of the study.

The dental health questions were constructed in a collaboration between the Copenhagen School of Dentistry and the National Institute of Public Health. The data analysis included a number of independent variables with standard classifications: i.e., sex, age group, education and training, occupation, and personal and household income (29). Occupation was divided into the following categories: self-employed, salaried staff-members, skilled workers, unskilled workers, unemployed, and retirees (early retirement or of pensionable age). Analysis of the data was conducted using the Statistical Package for the Social Sci-

TABLE 1

Percent Distribution of Participants According to Number of Natural Teeth Present as Well as Proportion of Respondents Who Reported Having Removable Dentures

Number of Teeth	Age (Years)							Total (n=16,659)*
	16-24 (n=2,184)	25-34 (n=2,817)	35-44 (n=2,999)	45-54 (n=3,177)	55-64 (n=2,480)	65-74 (n=1,612)	75+ (n=1,390)	
0	—	—	1	2	9	27	46	8
1-9	—	—	1	2	9	14	17	5
10-19	1	1	2	7	16	19	17	7
20 or more	99	99	96	89	66	40	20	80
Have removable dentures	— (n=439)	1 (n=653)	2 (n=660)	9 (n=745)	32 (n=584)	58 (n=375)	73 (n=286)	19 (n=3,742)*

Excluding missing cases.

ences (SPSS) and a number of univariate, bivariate, and multivariate distributions were carried out. The chi-square test was used for statistical evaluation of differences in proportions. Finally, multivariate logistic regression analysis was performed to assess the impact of independent variables on dentate status while controlling for potential confounders. Odds ratio estimates were calculated and tested using Wald statistics.

Results

Dentate Status. Of persons interviewed, 8 percent were edentulous, 12 percent had 1-19 teeth, and 80 percent had 20 or more natural teeth. As shown in Table 1, just under 10 percent of the 55-64-year-olds were edentulous, and the proportion of edentulous individuals gradually increased to almost half the persons 75 years of age and older. Parallel to this, the proportion of respondents with at least 20 teeth fell steadily from the age of 45-54 years. Responses to the self-administered questionnaire showed that 19 percent of all adults had removable dentures (Table 1); one-third of the respondents in the 55-64 age group wore dentures, as did three-quarters of those 75 years of age and older. There were no significant variations between men and women with regard to distribution by dentate status or the prevalence of dentures.

Tables 2-3 show a link between dentate status and socioeconomic variables controlling for age. Among the young adults there were minor variations in dentate status, whereas in the age groups 45-64 years and 65 years

TABLE 2

Percentages of Participants Who Were Edentulous, Percentages of Persons with 20 Teeth or More, and Percentages Having Removable Dentures, in Relation to Age and Education

	Years of School Completed			High School	Total
	7 or Less	8-9	10-11		
25-44 years					
Edentulous	1	1	—	—	1
20 or more teeth	88 (n=70)	97 (n=1,045)	98 (n=2,387)	99 (n=2,257)	98 (n=5,759)
45-64 years					
Edentulous	12	4	1	1	5
20 or more teeth	56 (n=1,664)	81 (n=1,325)	90 (n=1,705)	96 (n=922)	79 (n=5,616)
65+ years					
Edentulous	47	25	12	6	36
20 or more teeth	20 (n=1,919)	38 (n=410)	57 (n=476)	66 (n=171)	31 (n=2,976)
25+ years					
Have removable dentures	60 (n=815)	18 (n=599)	8 (n=1,040)	3 (n=810)	22 (n=3,264)

and older, significantly ($P<.001$) more participants were edentulous, and there were fewer persons with 20 or more teeth ($P<.001$) in the less educated group (Table 2). A similar pattern of comparatively many edentulous and few persons with at least 20 teeth was observed among the low-income groups ($P<.001$) (Table 3). With regard also to the prevalence of denture wearers, there were significant differences according to level of education ($P<.001$) and income ($P<.001$) (Tables 2-3). The demonstrated effects on dental health indicators could be noted for both personal and house-

hold income.

In relation to occupation, marked variations in dentate status were revealed, e.g., at ages 45-64 years 90 percent of salaried employees had at least 20 teeth, as did 84 percent of the self-employed, 82 percent of skilled workers, and 70 percent of unskilled workers. In all, 67 percent of the unemployed in this age group had at least 20 teeth, and this applied to 57 percent of the early retirees. Responses to the question concerning dentures showed that among 45-64-year-olds, 25 percent in the group of employed and 43 percent in the group of pensioners

TABLE 3
Percentages of Participants Who Were Edentulous, Percentages of Persons with 20 Teeth or More, and Percentages of Respondents Having Removable Dentures, in Relation to Age and Personal Annual Income

	Personal Annual Income (DKK)					Total
	Below 100,000	100,000–199,999	200,000–299,999	300,000–399,999	400,000 or Higher	
25–44 years						
Edentulous	1	1	—	—	—	1
20 or more teeth	97 (n=395)	97 (n=1,627)	98 (n=2,278)	99 (n=827)	99 (n=495)	98 (n=5,622)
45–64 years						
Edentulous	15	8	3	2	1	5
20 or more teeth	54 (n=448)	70 (n=1,622)	84 (n=1,861)	90 (n=788)	93 (n=604)	79 (n=5,323)
65+ years						
Edentulous	46	31	12	8	3	36
20 or more teeth	21 (n=1,243)	34 (n=1,021)	58 (n=231)	54 (n=50)	69 (n=59)	31 (n=2,604)
25+ years						
Having remov- able dentures	54 (n=482)	27 (n=996)	10 (n=1,013)	5 (n=386)	5 (n=278)	22 (n=3,155)

TABLE 4
Percentages of Participants Who Reported Having Visited Dentist Within Past 5 Years, and Percentages of Respondents Who Had Participated in School/Child Dental Services or Other Regular Dental Care During Childhood in Relation to Age

	Age (Years)							Total
	16–24 (n=2,184)	25–34 (n=2,817)	35–44 (n=2,999)	45–54 (n=3,177)	55–64 (n=2,480)	65–74 (n=1,612)	75+ (n=1,390)	
Dental attendance								
Regular	83	78	87	89	84	66	46	80
Irregular	16	20	10	6	7	9	13	11
None	1	2	3	5	9	25	41	9
Participation in school/child dental services								
All grades	83	86	53	42	30	17	10	50
Some grades	15	11	18	17	20	12	6	15
Other dental care	2	3	24	26	22	22	20	17
No dental care	— (n=445)	— (n=665)	5 (n=666)	15 (n=741)	28 (n=572)	51 (n=348)	64 (n=256)	18 (n=3,683)

were denture wearers.

Use of Dental Health Services. Among those persons interviewed, 80 percent could be characterized as regular users of adult dental services during the past five years, 11 percent were irregular users, while 9 percent had not sought dental care during this period. For the age groups 16–24 years and up to 55–64 years, eight or nine out of 10 persons regularly visited a dentist; this applied to two-thirds of the 65–74 year olds, and to almost half the elderly 75 years and older (Table 4). Responses to the questions on partici-

pation in dental services during childhood are shown in Table 4. Among the youngest adults, the vast majority informed that they had participated in school dental health services; half the respondents in the age group 65–74 years and nearly two-thirds of those 75 years and older had not regularly received dental care during childhood, either at school dental service or other regular care at a private dental practitioner.

Regardless of age, there were significantly more individuals with regular dental visits in the group of high

school (and equivalent) graduates than in the group with seven or fewer years of schooling ($P<.001$) (Table 5). Parallel to this, there was a link between the frequency of regular dental visits and personal income (Table 6); the effect of income was greatest for the age groups 45–64 years and 65 years and older ($P<.001$).

Dentate Status—Use of Dental Health Services. Table 7 illustrates the proportion of adults with different dentate status in relation to the use of dental services in childhood and in adulthood. The data presented are

stratified by age group. Among the 25–44-year-olds there were relatively few individuals with at least 20 teeth in the group who had not regularly received dental care during childhood ($P<.01$). For the remaining age groups, there were greater variations ($P<.001$)

in dentate status in relation to participation in regular dental care in childhood; similarly, the proportions of edentulous persons and denture wearers were significantly higher in the group "no dental care" ($P<.001$). Among respondents aged 45–64 years

and 65 years and older, the group who had not regularly received dental care included significantly more edentulous persons and denture wearers, and fewer persons with at least 20 teeth ($P<.001$), than the group who regularly visited a dentist.

Multivariate Analysis. Table 8 shows the results of the logistic regression analyses of the three dental health status indicators (20 teeth or more, edentulous, removable dentures). The table shows only independent variables with statistically significant main effects and thus comprises personal income, education, current dental attendance, and dental care during childhood. The bivariate effect of the age group disappeared in the multivariate analysis. The results show, for example, that the odds of having 20 teeth or more were significantly lower for persons with low incomes (<DKK 100,000) than for those with high in-

TABLE 5
Percentages of Interviewees with Regular Dental Attendance in Past 5 Years in Relation to Age and Education

Age (Years)	Years of School Completed				Total
	7 or Less	8–9	10–11	High school	
25–44	65 (<i>n</i> =76)	79 (<i>n</i> =1,045)	83 (<i>n</i> =2,391)	84 (<i>n</i> =2,258)	82 (<i>n</i> =5,770)
45–64	76 (<i>n</i> =1,668)	88 (<i>n</i> =1,329)	93 (<i>n</i> =1,705)	93 (<i>n</i> =923)	87 (<i>n</i> =5,625)
65+	45 (<i>n</i> =1,930)	68 (<i>n</i> =411)	83 (<i>n</i> =476)	90 (<i>n</i> =171)	57 (<i>n</i> =2,988)

TABLE 6
Percentages of Interviewees Stating They Had Regular Dental Attendance in Past 5 Years in Relation to Age and Personal Annual Income (\$1 US=7.8 DKK)

Age (Years)	Annual Income (DKK)					Total
	Below 100,000	100,000–199,999	200,000–299,999	300,000–399,999	400,000 or Higher	
25–44	75 (<i>n</i> =394)	80 (<i>n</i> =1,624)	84 (<i>n</i> =2,273)	85 (<i>n</i> =825)	85 (<i>n</i> =494)	82 (<i>n</i> =5,610)
45–64	70 (<i>n</i> =448)	83 (<i>n</i> =1,620)	90 (<i>n</i> =1,860)	93 (<i>n</i> =787)	94 (<i>n</i> =604)	87 (<i>n</i> =5,319)
65+A	46 (<i>n</i> =1,240)	62 (<i>n</i> =1,019)	83 (<i>n</i> =231)	94 (<i>n</i> =50)	88 (<i>n</i> =59)	57 (<i>n</i> =2,599)

TABLE 7
Percentages of Participants Who Reported Being Edentulous, Having 20 or More Teeth, as well as Percentages of Respondents with Removable Dentures in Relation to Age and Regular Dental Care (in Childhood and Currently) (Number of Respondents, See Table 4)

Age (Years)	Participation in School/Child Dental Services				Dental Attendance in Past 5 Years	
	All Grades	Some Grades	Other Regular Dental Care	No Dental Care	Regular	Not Regular
25–44						
Edentulous	—	—	1	—	—	1
20 or more teeth	99	97	99	86	91	96
Removable dentures	0.7	3	2	3	1	1
45–64						
Edentulous	4	2	4	12	1	33
20 or more teeth	86	85	86	61	85	38
Removable dentures	13	17	14	38	14	57
65+						
Edentulous	20	25	16	44	5	76
20 or more teeth	43	45	54	23	50	5
Removable dentures	57	55	41	74	46	91

TABLE 8

Multivariate Logistic Regression Analysis of Dentate Status Variables in Relation to Personal Income, Education, Current Dental Attendance, and Participation in Dental Care During Childhood (Figures indicate odds ratio estimates for three outcomes: 20 teeth or more, edentulousness, and presence of removable denture)

Variable	Category	20 or More Teeth	Edentulousness	Removable Denture
Personal income (annual income in DKK)	<100,000	0.60*	NS	2.26†
	100,000–199,999	0.83		1.50*
	200,000–299,999	1.20		1.22
	300,000–399,999	1.55		0.66
	400,000–499,999	—	—	—
Education	7 years	0.23†	2.98*	5.46†
	8–9 years	0.43†	3.43*	2.53†
	10–11 years	0.64*	1.26	1.50
	High school/equivalent	—	—	—
Current dental attendance	No visits	0.06†	107.7†	9.41†
	Not regular	0.26†	12.99†	3.25†
	Regular	—	—	—
Dental care in childhood	School dental services			
	All grades	2.13†	0.60‡	0.60‡
	Some grades	2.16†	0.47†	0.77
	Other regular dental care	2.22†	0.82	0.61†
	No dental care	—	—	—
R ² (Cox and Snell)		0.39	0.31	0.38

* $P < .05$.

† $P < .001$.

‡ $P < .01$.

comes (DKK 400,000 and over). Additionally, persons who received regular dental care during childhood were twice as likely to have 20 teeth or more as adults than those who had not received such care.

Discussion

The present study is based on data collected as part of the systematic survey program developed by the National Institute of Public Health for monitoring health conditions in the Danish population (24,29). In all, ethnic minorities account for 5 percent of the population in the country. The study population comprises a nationally representative random sample of adult Danes, and the size of the random sample yields solid analytical potential. In this survey program, data collection is conducted primarily through personal interviews in the respondent's own home, conducted by professional interviewers from the Danish National Institute of Social Research. Thorough training of the interviewers helped to ensure reliability and thus validity of the data. Experience has shown that a personal interview yields a high quality of collected

data and generally a higher rate of participation is achieved than through use of self-administered questionnaires (30). Because of this study's considerable demand for data, the interview was supplemented by a self-administered home-based questionnaire. Both data collection methods achieved satisfactory response rates and only minor differences in sociodemographic profiles among participants and nonparticipants were observed (29).

In epidemiologic studies, health measurements are done most often on the basis of professional, objective registration criteria. However, the data of this study derive from highly structured interviews and questionnaires. The measurements here are based on a broad concept of health incorporating a self-evaluation of health status. When measuring oral health status, the number of teeth has been chosen as the key health indicator, while the present questionnaire survey complements this by including the prevalence of removable dentures. As in previous studies (17,22), two dentate status categories of clinical significance and relevance for planning of dental health

services have been defined for analysis purposes. These are edentulousness and the presence of 20 or more teeth, as has been suggested as an operative expression for a functional natural dentition.

The available figures for the year 2000 show a positive dentate status profile for age groups under 55 years of age, a large majority of those interviewed reporting they had a functional dentition. However, this also applied to two-thirds of the 55–64-year-old age group and four out of 10 persons aged 65–74 years. Almost half of the elderly 75 years and older were edentulous, and only one-fifth had a functional natural dentition. It may be ascertained that marked social disparities in dentate status continue to exist in Denmark, preponderantly among the middle-aged and elderly. Poor dentate status and the prevalence of removable dentures were especially frequent among the unemployed and early retirees, as has also been observed in local studies (18). Generally, edentulousness is seen most frequently among persons with limited education and low income, while the vast majority of those with higher edu-

cation and income claimed they had a functional dentition. These findings thus confirm previous reports on social inequities in the prevalence of oral disease among adult Danes (13,14,17), but the data also corresponds to similar recent studies carried out in other countries (2,5). The multivariate analysis of dentate status showed that there were separate, direct effects of both socioeconomic and behavioral variables. Data thus support health sociological theory on social inequities in health (dentate status), where poor health (dentate status) is primarily explained as a result of poor living conditions and limited capacity for action, as well as inappropriate health behavior (14).

Dental Health Services and Dentate Status. In interview surveys, some overestimation of regular dental attendance may occur, while recall bias regarding dental services received when participants were school-aged is possible, particularly among other adult age groups. The present study has shown that eight out of 10 adults reported regular use of dental services; from an international perspective the use of adult dental services in Denmark is thus remarkably high (19). However, the actual information indicates that dental attendance is declining among younger adults. With regard to adult dental care habits, previous Danish (13-17) and more recent studies (2,5,31,32) conducted in other countries have documented clear variations according to socioeconomic conditions, and such correlations are confirmed by the present study. For all adult age groups, it applies that regular dental attendance is markedly

lower among people with lower educational and income levels.

In accordance with the Act on Dental Health Care (12), the aim of dental care is to encourage the population to develop appropriate self-care practices and make use of preventive and curative services to maintain the life-long function of teeth, mouth, and jaws. The adult population's self-care profile in relation to social factors and use of dental health services has been described in a separate report (25). It is likely that the community-oriented preventive programs implemented have contributed to the development of appropriate personal dental care habits, awareness of dental health, and positive dental attitudes toward preservation of natural teeth. Also, it is possible that dentists changed their treatment practices over time from somewhat radical treatment forms such as tooth extraction toward curative and preventive services being part of the regular dental check-up.

The present study indicates that the majority of the adult population attends regularly for dental care, and in addition to younger adults, a considerable proportion of the middle-aged today have benefited from either school/ child dental services or other regular dental care during childhood. The analysis clearly documents that regular dental care during childhood has a positive effect on dentate status in adulthood. The multivariate analyses have shown that participation in child dental care increases by a factor of two the likelihood of retaining functional natural dentition in adulthood, and markedly reduces the risk of edentulousness and removable den-

tures. Correspondingly, the analyses show a significant link between dentate status and current, regular dental visits. Meanwhile, the study design implemented here does have certain limitations when it comes to drawing firm conclusions concerning cause and effect. The question is thus whether maintenance of functional dentition may be attributed to regular dental visits, or whether the loss of teeth is the reason for irregularity in or absence of dental visits.

Trends in Dental Health of Adults.

The national studies of health and morbidity are set up in such a way as to regularly (every six or seven years) compile systematic information on the health of the population (18). The aim is to procure time series data on health indicators, making it possible to track developments. The first general health study was conducted in 1987 (22), and has since been followed up in 1994 (17,23) and 2000. Table 9 compares the information on dentate status and regular dental visits over the time period 1987 to 2000, and remarkable improvements can be ascertained for all age groups. Among the 65-74-year-olds, the proportion of edentulous persons was halved, and nearly three times as many people had a functional natural dentition in the year 2000 as in 1987. This tendency corresponds to developments in industrialized countries around Denmark, such as the United Kingdom (5) or Sweden (7), as well as the United States (3). Marked changes over time also can be seen in dental visiting habits. Among younger adults, regular dental visits are declining, whereas the opposite is the case among the older adults. At age 65-74

TABLE 9

Percentages of Interviewees Who Reported Being Edentulous, Having 20 or More Teeth, and Visiting Dentist Regularly in Relation to Age and Time of Study (1987, 1994, 2000) (17,22)

Age (Years)	Edentulous			20 or More Teeth			Regular Dental Attendance		
	1987	1994	2000	1987	1994	2000	1987	1994	2000
16-24	—	—	—	99	100	99	91	87	83
25-34	1	—	—	97	99	99	90	84	78
35-44	2	1	—	87	95	97	88	89	87
45-54	12	4	2	61	83	89	75	87	89
55-64	33	24	9	39	51	66	54	68	84
65-74	51	40	27	16	29	40	35	51	66
75+	66	55	46	7	12	20	31	35	46

years, almost twice as many had regular dental visits in 2000 as in 1987.

Achievement of Goals for Oral Health in 2000. In the early 1980s the World Health Organization (WHO) formulated global and regional goals for health by the turn of the millennium as a part of the so-called "Health-for-All" program (33). The general health goals of most relevance to oral health focus on the achievement by the year 2000 of a marked reduction in inequities in health (Target 19), more people should enjoy better quality of life (Target 2), significantly fewer people should suffer from chronic disease (Target 4), and access of the population to primary health care services should be improved (Target 28). On the basis of the present analyses, it may be concluded that significant results have been reached in relation to the general goals set by WHO. More adult Danes now have a functional natural dentition, which is an important precondition for quality of life (Target 2); there has been a significant reduction in edentulousness (Target 4); and a larger proportion of the population makes use of dental services (Target 28). However, the goal of eradicating social inequities in dentate status has not yet been achieved, in particular among the older population. Figure 1 illustrates this pattern for people 65 years of age and older, and here the same classification for education has been used at the times of both studies. Remarkably, the gradients for education are largely identical for the years 1994 and 2000 with regard to the prevalence of edentulousness and the presence of at least 20 teeth, respectively.

In 1982, the World Health Organization and the Fédération Dentaire Internationale (FDI) formulated specific oral health goals for the year 2000 (26,27) and in 1985 the Danish National Board of Health (28) supplemented these goals. The international WHO targets for the year 2000 imply dentate status for Danish adults as follows:

35–44 years:

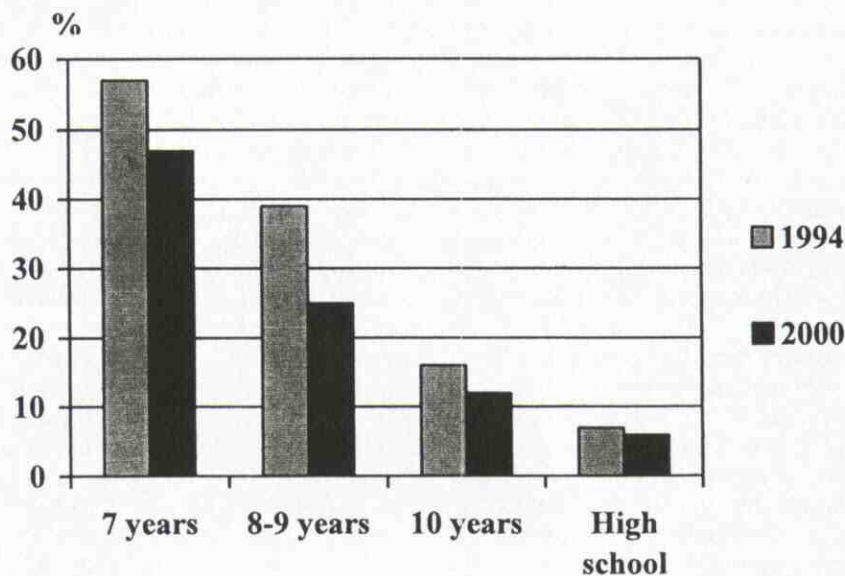
- edentulousness appears only exceptionally
- at least 75 percent have 20 or more teeth

65 years and older:

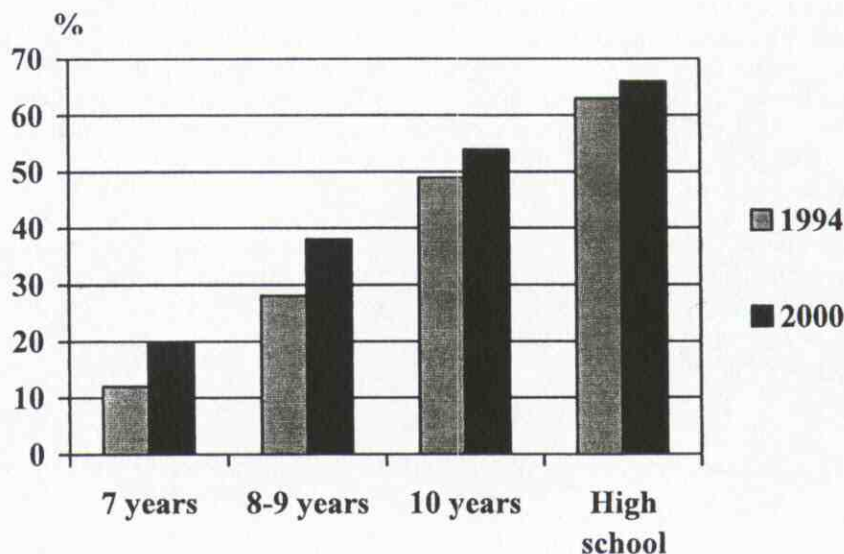
- a maximum of 40 percent are totally edentulous
- at least 50 percent have 20 teeth or

FIGURE 1
Percentages of Interviewed Elderly (65 Years or Older) Who Reported Being Edentulous or Having at Least 20 Teeth Present in Relation to Number of Years Having Attended School and Year of Study

Edentulousness



20 teeth or more



more

The targets formulated by the National Board of Health (28) are:

35–44 years:

- edentulousness appears only exceptionally
- at least 97 percent have at least 20 natural teeth

65 years and older:

—a maximum of 45 percent are totally edentulous

—at least 40 percent have at least 20 natural teeth

The current data for 35–44-year-olds in the year 2000 show that the targets formulated by WHO and the National Board of Health have been achieved for both dentate status indi-

cators. However, the goals for the year 2000 relating to the proportion of elderly with at least 20 teeth were not achieved (31% have 20 teeth or more), but the goals for the frequency of edentulousness (36%) were reached. The positive development in edentulousness has been so rapid that the latest prognoses suggest edentulousness in the year 2020 may be expected to be modest (<2%) among the adult population as a whole (21).

In conclusion, the present study has helped to highlight that the dentate status of adults in Denmark has improved in general. This may be ascribed partly to the increased use of dental services and the fact that an ever-larger proportion of the adult population received regular dental care in childhood and adolescence. To this must be added that the population's self-care practices in oral health, general lifestyles and living conditions have changed in recent years. However, it remains a challenge for the Danish adult dental care system to help even out the social inequities in dental conditions. The present report indicates that efforts in coming years should focus to a large extent on promoting oral health among the population of elderly. In accordance with WHO's strategic plan for the 21st century (34), the Danish National Board of Health will be required to take the initiative of formulating new national goals for oral health for the year 2020.

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