Utilization of dental care after the introduction of the Swedish dental health insurance

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The dental care utilization rate in an urban Swedish population over an 11-year period was studied, starting at the time of the introduction of a national dental health insurance. The systematically selected samples comprised, for each calendar year of the period, approximately 11,000 inhabitants more than 20 years of age in the city of Göteborg. In 1976 and 1984 information on utilization was coupled to information about various demographic, socioeconomic, and disablement factors. In addition, a longitudinal study was performed of 8012 people who resided in Göteborg in 1976 and 1984, correlating dental attendance rates with the same factors. The results showed that dental care utilization increased among both men and women, mostly in age groups more than 65 years of age. Utilization rate in 1976 and in 1984 was independently associated with age, sex, income, marital status, disablement, and regions of the city, and it is concluded that the goal of the dental insurance act, which was, among other things, to contribute to a more equitable distribution of dental care, in many respects has not been achieved. Early identification of people with low utilization may provide a means to obtain the most pronounced improvement in dental health. □ *Dental health survey; economics; epidemiology, oral; insurance, dental*

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The National Dental Health Insurance introduced in Sweden in 1974 aimed at improving the possibilities for the population at large to obtain optimal dental care on an economically more equitable basis (1). Thus, it was assumed that the dental health insurance would contribute to decreased differences in dental care utilization between people belonging to different subgroups varying with regard to, for example, socioeconomic background. It was further presumed that regular dental care is an important factor for the improvement and maintenance of dental health.

Improvement of dental health in the population is an important goal for the dental health care system. If the achievement of this goal is conditional on an increased utilization of dental care, it follows that it would be of value if this could be assessed in a manner making it possible to identify factors that influence the variation in dental care utilization between individuals.

The National Swedish Social Insurance Board continuously collects data on the consumption of dental care by the Swedish population, enabling the study of utilization rates and frequencies of various diagnostic, preventive, and restorative procedures relative to age and sex.

The aims of the present study were to investigate the annual utilization rate of dental care in an adult population over a total period of 11 years, starting with the year of the introduction of a comprehensive dental health insurance, and, further, to compare utilization rates and utilization patterns in subgroups differing with regard to sociodemographic characteristics, socioeconomic conditions, social support, and disablement.

Study population and methods

The study population comprised systematically selected samples from among all inhabitants in Göteborg, Sweden, during 1974 and up to and including 1984. Göteborg is the second largest city in Sweden, with approximately 450,000 inhabitants. It is dominated by its harbor and major industries (2). One part of Göteborg, the northern region, differs from the others in that many residents belong to lower-income strata. Furthermore, it has a larger proportion of immigrants than other parts of the city. The relative number of dentists in Göteborg exceeds the national average, which is about 1 for 850 inhabitants.

The sample for each calendar year consisted of all people above 20 years of age born on the 20th of every month. The number of people in each sample varied between 11,028 and 11,233. Information on people born on the 20th of every month who had received dental care was obtained from the National Dental Health Insurance Register, to which dental bills from both private and public dental clinics are sent via the local insurance offices irrespective of where in Sweden the dental care is given. Utilization of dental care was defined as any contact with a dental clinic resulting in a bill during a calendar year.

Table 1. Number of subjects in the 1976 and 1984 investigations and percentage of subjects belonging to different subgroups

Age, years	No. of subjects	Not married	Living in northern region	Early retirement pension	Sick leave (>30 days)	Housing allowance
1976 investigation						
20–34	3608	58	15	1	19	
35–49	2379	32	29	5	22	
50–64	2911	29	16	16	21	
65–	2246	52	10			47
Total	11,144	44	21			
1984 investigation						
20–34	3225	74	14	1		
35–49	2689	42	26	5		
50–64	2464	33	22	19		
65–	2625	51	12			32
Total	11,003	51	21			

With regard to the calendar years 1976 and 1984 information obtained from the National Dental Health Insurance Register was coupled to another register from the National Social Insurance. This register contained information on annual income, marital status, living area, housing allowances (HA) (only above 65 years of age), disablement factors such as early retirement pension, and number of days of sick leave (only in 1976) (Table 1). The data were received from a register kept at the National Social Insurance Board. Information about these data was collected for only two years because of financial constraints. The year 1976 was chosen instead of 1974 or 1975 because the representativeness of the data from the latter years could be questioned because those years were the first after the introduction of the National Dental Health Insurance Act.

In addition to the cross-sectional studies being performed over the period, a longitudinal study was made with regard to inhabitants residing in Göteborg in 1976 who still were residing there in 1984. A total of 8012 inhabitants were included in this part of the study, in which regular care attendance was also assessed.

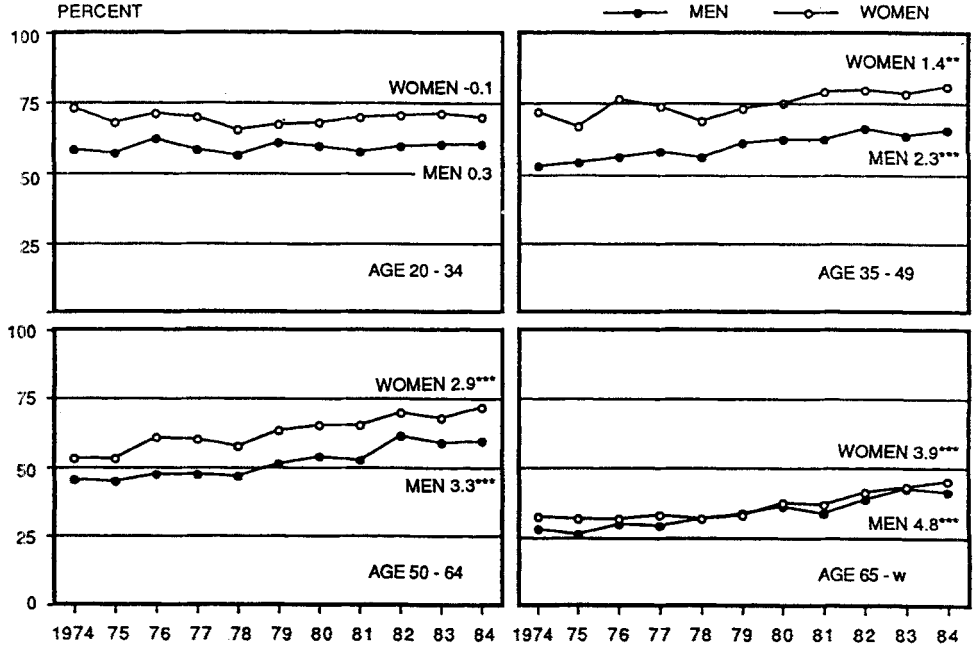

Fig. 1. Utilization of dental care (percentage) from 1974 up to and including 1984 in different age groups. Mean annual change of utilization and significance level: $*p < 0.05$; $**p < 0.01$; $***p < 0.001$.

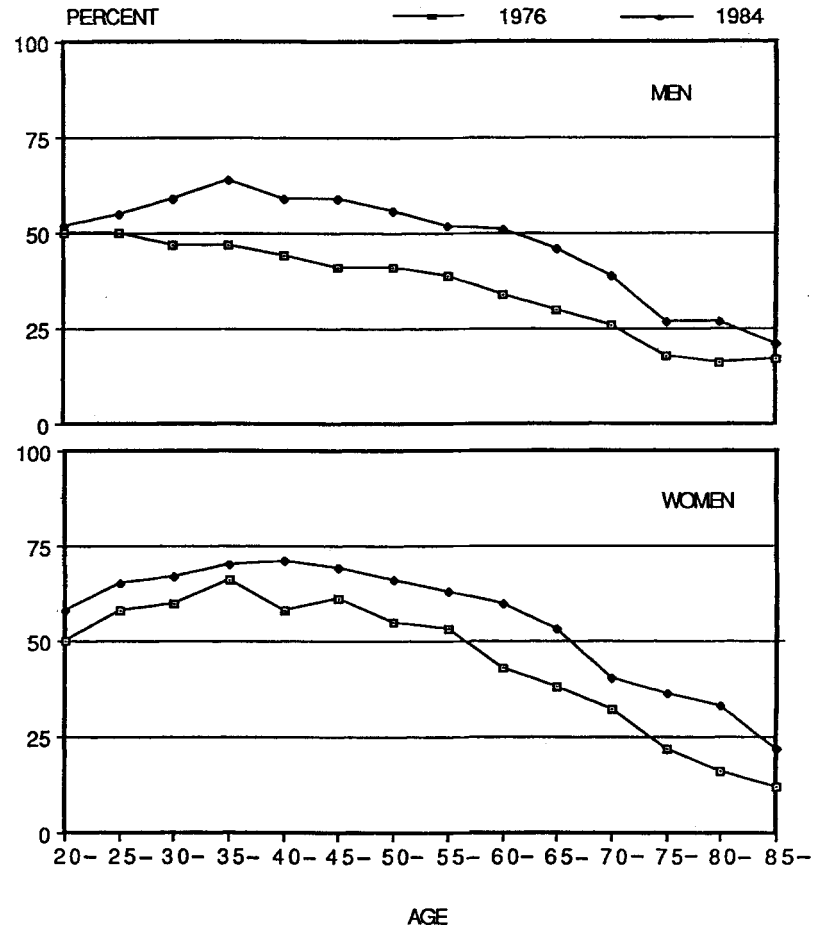

Fig. 2. Age cohort comparisons of dental care utilization (percentage) between 1976 and 1984.

Residents receiving dental care at least once each calendar year during a minimum of 7 years were defined as regular attenders.

The National Social Insurance Board estimated that during the years covered by the study between 2.0% and 12.7% (mean, 8.1%) of all dental bills were not received at the insurance register.

Statistical methods

To test for trend over time in the utilization of dental care, exponential linear regression analyses were used. A non-parametric technique, based on Pitman's test variables, was used for testing the conditional correlation between two variables when the values of other variables were kept constant (3). The technique is similar to that proposed by Mantel (4). Stepwise logistic regression analysis was used to find a minimal set of population characteristics to explain the variation in utilization of dental care.

Logistic regression models were also used to estimate the probability for utilization in accordance with the formula: estimated probability $= S = B_0 + B_1 \cdot X_1 + \ldots B_k \cdot X_k$, where B_0, B_1 ... B_k are the coefficients obtained in the models. S = estimated probability of one individual utilizing dental care.

Results

Time trends

With regard to the total samples an increase in the utilization of dental care occurred between 1974 and 1984 among both men and women. The estimated annual increase in the pooled time trends was 2.7% ($p < 0.001$) among men and 2.0% ($p < 0.001$) among women. Women in 1974 utilized dental care to a higher extent than men and continued to do so up to and including 1984.

The differences in the time trend between age groups are obvious (Fig. 1). The largest increase in utilization of dental care occurred in the highest age groups, whereas a slight decrease took place in the age group

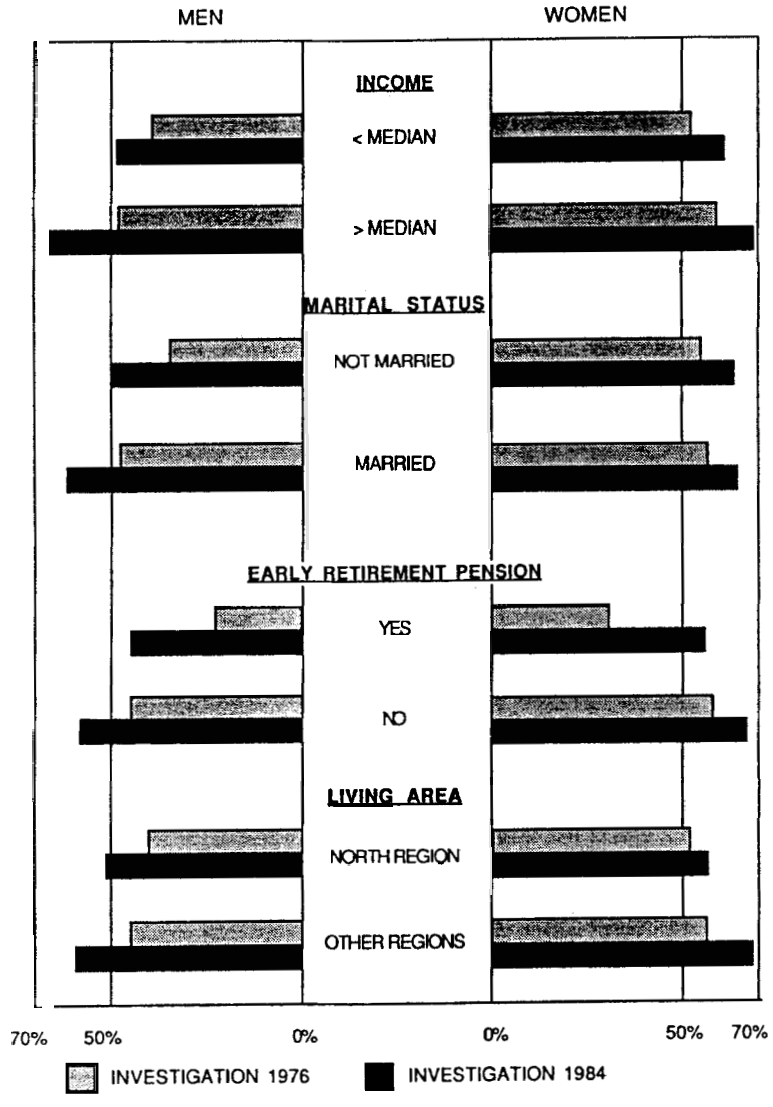

Fig. 3. Age-adjusted (20–64 years) prevalence of dental care utilization (percentage) in groups of inhabitants with different characteristics in 1976 and 1984.

20–34 years. Although the lowest degree of utilization of dental care was found in age group 65 years and above, this group showed the largest increase over the 11-year period, from 26% in 1974 to 39% in 1984. Women in age group 35–49 years had on an average the largest utilization of dental care over the total time period. In the highest age group, 65 and above, there were practically no differences between men and women in utilization rates.

Cross-sectional comparisons, 1976 and 1984

Age cohort comparisons with regard to utilization of dental care between 1976 and 1984 are found in Fig. 2. On average, a more marked increase was found for men than for women. For men in the age interval 35–70 years the utilization in 1984 was about 15% units higher than in 1976. In age groups 60 years and older there was a proportional increase by more than 50% among both men and women. The cohort differences between 1976 and 1984 are statistically significant in all 5-year age groups except with regard to men in the age interval 20–24 years.

In all subgroups with different characteristics in income, marital status, area of living, early retirement pension, and housing allowance, the utilization was higher in 1984 than for corresponding subgroups in 1976 (Fig. 3). The sex differences were marked in most of the subgroups in both 1976 and 1984. In 1984 the groups with the characteristics low income, not married,

Table 2. Cohort comparisons of ratios for utilization of dental care between groups with different characteristics in the 1976 and 1984 investigations. The differences in the 1976 and 1984 ratios are given with significance levels (asterisks)

Age group, years	Income: <median/>median		Marital status: not married/married		Early retirement pension: yes/no		Area of living: north/others		Housing allowance: yes/no	
	1976	1984	1976	1984	1976	1984	1976	1984	1976	1984
Men										
28–35	0.79	0.88	0.78	0.88	0.48	0.78	0.84	0.88	NE	NE
44–51	0.82***	0.63	0.75	0.74	0.58	0.64	0.96	0.83	NE	NE
59–64	0.63	0.68	0.63	0.64	0.53	0.58	0.81	0.96	NE	NE
20–64 (age adjusted)	0.81	0.74	0.72	0.82	0.57	0.61	0.88	0.87	NE	NE
73–80	NE	NE	1.04*	0.53	NE	NE	0.32	0.71	0.38	0.62
65– (age adjusted)	NE	NE	0.64	0.64	NE	NE	0.53	0.78	0.51	0.72
Women										
28–35	0.89	1.02	0.97	0.97	0.73	1.09	0.87	0.84	NE	NE
44–51	0.91	0.86	0.89	0.97	0.71	0.72	0.78	0.78	NE	NE
59–64	0.83	0.76	0.76	0.99	0.54	0.59	0.84	0.78	NE	NE
20–64 (age adjusted)	0.88	0.89	0.92	0.97	0.55*	0.72	0.89	0.83	NE	NE
73–80	NE	NE	1.26	1.01	NE	NE	0.52	0.65	0.47	0.60
65– (age adjusted)	NE	NE	0.97	0.93	NE	NE	0.71	0.65	0.58	0.58

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; NE = not evaluated.

living in the northern region, and having early retirement pension had approximately the same level of utilization as the corresponding groups without these characteristics in 1976.

The ratios of dental care utilization between groups with different characteristics in the 1976 and 1984 investigations are shown in Table 2. With few exceptions there were no marked cohort differences in ratios between 1976 and 1984. In the 1976 investigation the age-adjusted ratio for sickleave (>30 days) was 0.73 among men and 0.69 among women in the age group 20–64 years.

A stepwise logistic regression analysis performed for the age interval 20–64 years (Table 3) showed that the variables age, low income, not married, living in the northern region, and early retirement pension were negatively, independently associated with dental care utilization both in 1976 and 1984. Among men in the age group 65 years and older the characteristics housing allowance and not married were significant factors for utilization in both investigations.

Fig. 4 illustrates the marginal contribution to the utilization of dental care for each independent factor computed by the logistic regression models for selected groups, at the ages of 34, 49, and 64 years. As can be seen in this figure, the difference in utilization between groups with negative and positive characteristics has not been equalized in men in 1984.

Longitudinal comparisons, 1976–84

Among the 8012 inhabitants who were followed up from 1976 to 1984, large variations in the utilization of dental care between age groups and gender were found (Fig. 5). For women 30–50 years of age in 1976, almost half of the population had utilized dental care at least once during each of a minimum of 7 years. From age 60 years and above more than 25% of both men and women had not made any dental visits at all.

Regular utilization (7–9 calendar years) was more frequent among women than men independent of age and other characteristics in 1976 (Fig. 6). The figure also shows that differences between the subgroups with regard to income and marital status were more obvious in men than in women.

The associations between regular dental care attendance and different socioeconomic and disablement factors were analyzed by stepwise logistic regression (Table 4). Regular dental care attendance was significantly commoner among married people, those with higher income, people living in other areas than the northern part of Göteborg, and among those who did not have early retirement pension or sickleave for more than 30 days.

Discussion

The results showed, in all age groups except those 20–34 years of age, a continuous and substantial increase in the utilization of dental care. Higher age groups showed the most marked increase, which can be partly explained by a decrease in the number of edentulous individuals occurring during the same period of time. This decrease has been substantial, as shown by Österberg & Mellström (5), who found a decrease in eden-

Table 3. Regression coefficient (beta) and significance level (asterisk) obtained for significant factors for utilization of dental care in different age groups in 1976 and 1984, computed by stepwise logistic regression

	Men				Women			
	Age 20–64 years		Age 65–		Age 20–64 years		Age 65–	
	1976	1984	1976	1984	1976	1984	1976	1984
Age	−0.020***	0.045*	NS	−0.048***	0.102***	NS	−0.048***	NS
Age ·· 2	NS	−0.001*	NS	NS	−0.001**	NS	NS	−0.001***
Income	0.048***	0.090***	NE	NE	0.039***	0.044***	NE	NE
Not married	−0.466***	−0.287***	−0.637***	−0.709***	NS	−0.161*	−0.709***	NS
Northern residence area	−0.330**	−0.287***	−0.626*	NS	−0.224**	−0.446***	NS	−0.724***
Early retirement pension	−0.387*	−0.304*	NE	NE	−0.815***	−0.576***	NE	NE
Housing allowance	NE	NE	−0.898***	−0.528**	NE	NE	−0.528**	−0.824***
Intercept	0.101	−1.023	−1.190	2.530	−1.779	0.483	2.530	1.192
Model chi-square	175.6 df5	199.7 df6	50.6 df3	61.1 df4	158.5 df6	114.9 df4	92.7 df3	103.4 df3

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; NS = not significant; NE = not evaluated.

Table 4. Regression coefficient (beta) and significance level (asterisk) obtained for significant predictive factors for utilization of regular dental care between 1976 and 1984, computed by stepwise logistic regression

	Age 1976							
	Men				Women			
Independent variables 1976	20–34 (n = 1152)	35–49 (n = 1060)	50–64 (n = 1095)	65– (n = 505)	20–34 (n = 1156)	35–49 (n = 1008)	50–64 (n = 1293)	65– (n = 847)
Intercept	1.3420	1.4111	2.5941	2.082	2.1034	−0.2237	−1.4473	−2.510
Age	NS	NS	NS	NS	0.0560***	NS	−0.0346**	−0.0504**
Not married	NS	−0.3659*	−0.6963***	−0.9471**	NS	NS	NS	NS
Income	0.0975***	0.1117***	0.1780***	NE	0.0830***	NS	0.0551*	NE
Early retirement pension	NS	NS	NS	NE	NS	−1.1803***	−0.9884***	NE
Northern residence region	−0.3544*	−0.3786*	NS	NS	−0.2896*	−0.4604**	−0.5492**	NS
Sick leave (>30 days)	−0.4630*	−0.4580*	NS	NE	−0.9033***	−0.7604***	−0.5052**	NE
Housing allowance	NE	NE	NE	−1.0803***	NE	NE	NE	−0.9034***
Model chi-square	33.5 df3	62.2 df4	95.8 df2	23.5 df2	66.1 df4	46.5 df3	70.8 df5	39.0 df2

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; NS = not significant; NE = not evaluated.

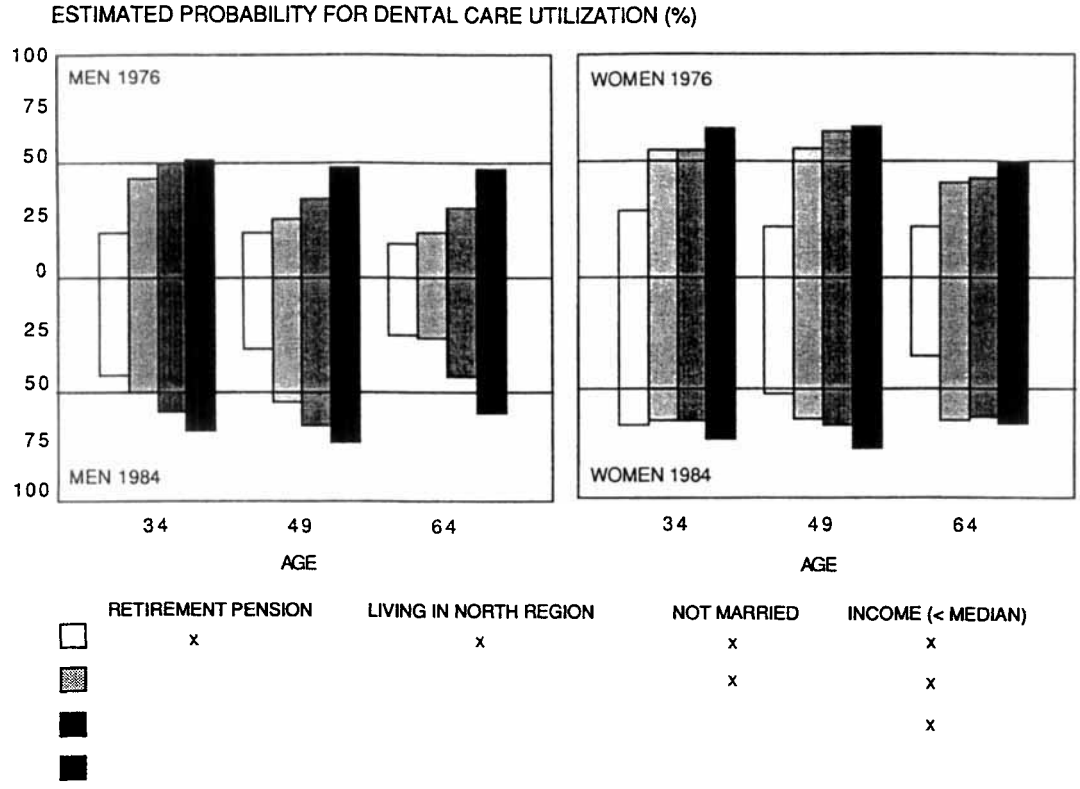

Fig. 4. Estimated probability for utilization of dental care for accumulation of negative population characteristics in 1976 and 1984 computed by logistic regression models.

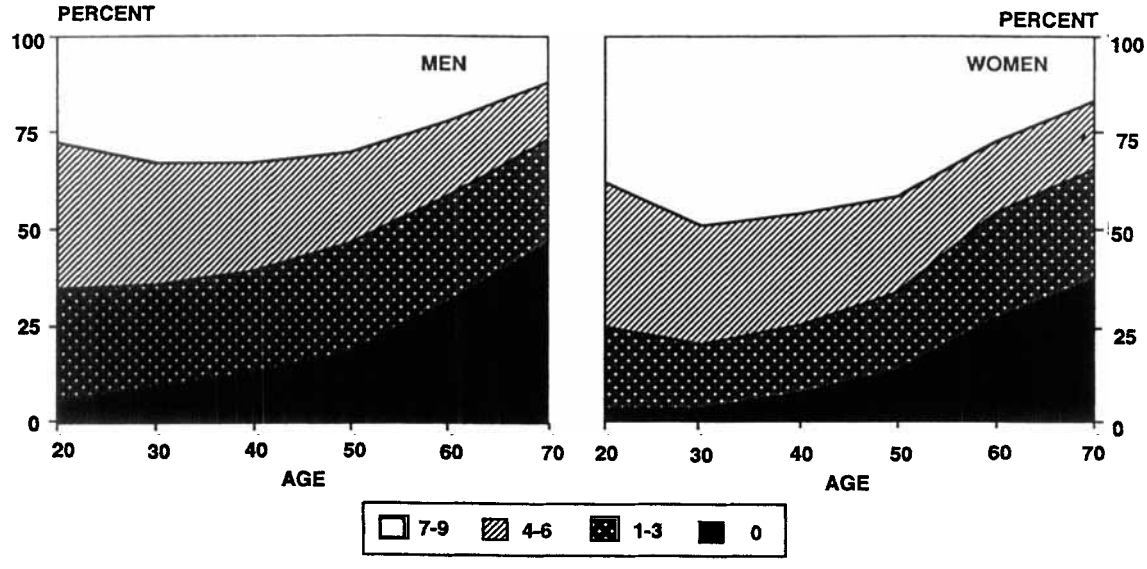

Fig. 5. Cumulative frequency distribution of inhabitants on the basis of the number of calendar years with dental care utilization during 1976–84 with regard to age in 1976.

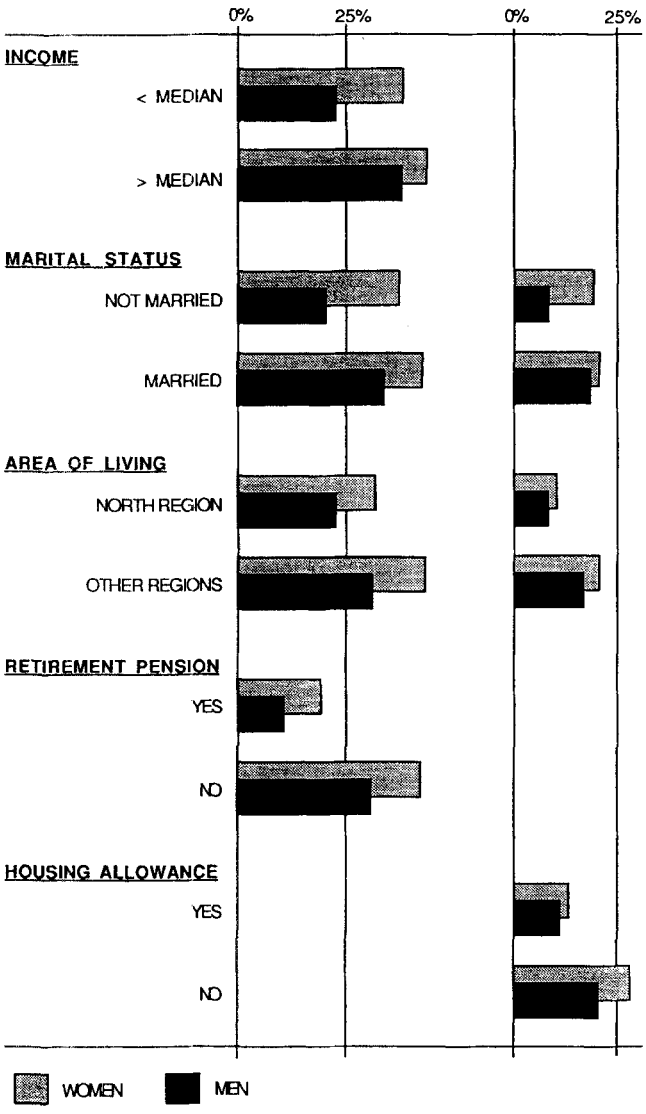

Fig. 6. Age-adjusted prevalence of regular utilization of dental care (7–9 calendar years) during 1976–84 among groups with different characteristics in age groups 20–64 and 65– years.

tulousness from 52% to 34% between 1972 and 1982 among the 70-year-old population in Göteborg. Ahlqwist et al. (6) demonstrated a decrease in edentulousness from around 20% to about 4% among 50-year-old women in the same city when studying representative samples in 1968–69 and 1980–81. The positive time trends of dental health have been described in several countries (7, 8). Edentulous individuals have been shown to have a low consumption of dental care compared with dentate ones (9–11). The great impact of these changes has been emphasized (12–15).

In controlled population studies it has generally been found that dental health is closely associated with several demographic, socioeconomic (including social support), and life-style factors (5, 9, 10, 15–20). It has also been shown earlier that regular dental care is associated with various social factors (9, 10, 21–25). The results of our study showed that dental care utilization is associated with the same kind of factors and that this was the case also among younger age groups. Even though dental care utilization increased over the period studied, the factors mentioned above were shown to play an equally important role in the end of the period and in its beginning. In fact, the highest increase in the utilization rate was found among those who initially showed the highest utilization rate, among people in higher income groups, and among those with the strongest social network.

Among men the utilization rate had increased by approximately 20%, implying that in 1984 it had become similar to that found among women in 1976. However, a low utilization rate was still found among unmarried men, those above 50 years of age, and those with low income. The largest increase among men was found among those in income brackets above the median. Regional differences were of the same magnitude in 1976 and 1984. However, in lower age groups differences between people from different residential areas had even increased. Thus, in some respects the aims of the dental insurance do not seem to have been fulfilled.

Among some groups the utilization rate was high in both 1976 and 1984. This was in particular the case for middle-aged women. In contrast, other groups showed a very low utilization rate; particularly older age groups and unmarried men, especially those belonging to low income strata. Thus, there was a large variation between groups in the extent to which dental care was utilized.

Early identification of groups of individuals with a low degree of dental care utilization would conceivably contribute much more to an overall improvement of dental health than a continued increase in dental care rate among those who already have the highest attendance rate. This opinion is in line with that of Bailit (26), who argued that dentistry has entered a new era in which it is, for the sake of dental health improvement, more important to identify people with a low dental care attendance and large treatment needs than to continue to allocate large parts of available resources to people in good dental health.

It is well known that there are several barriers contributing to a low utilization rate (27). Besides economic factors and availability of dental care, there are barriers caused by norms and attitudes, dental fear, general self-neglect, and so forth.

In Göteborg the availability of dental care is among the highest in the world, the standard of living is high, and economic factors should play a limited role as a barrier. Therefore, we believe that other factors are the most important reasons behind the low utilization rate. This is supported by the findings that residential area, marital status, and disablement factors had a significant

influence on utilization rate, independent of socio-economic conditions, age, and gender.

The information obtained from this study should be of value to dental care administrators responsible for the dental health care within populations. It stresses the importance of epidemiologic studies to assess dental care patterns and treatment needs in various subgroups. In addition, evaluation of the efficacy of dental treatment should be performed to elucidate further the influence of, for example, different recall patterns on dental health. It should then be possible to determine which factors contribute most to dental health improvement. Such knowledge is necessary for optimal allocation of dental health care resources.

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