Utilization of dental health services among middle-aged people in Sweden and Denmark

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In 1999, questionnaires were sent to random samples of 1001 Swedish citizens aged 55–79 years and 1175 Danish citizens aged 45–69 years. Various questions were asked concerning dental conditions, dental visit frequency per year, and money spent annually on dental care, etc. The objectives were to assess differences in the utilization of dental services and to compare out-of-pocket costs for dental care in Sweden and Denmark with control for age, gender, dental conditions and income. More than 80% of the subjects reported that a dentist had examined them less than 1 year previously. However, 77% of the Danes reported dental visits twice a year or more compared to 28% of the Swedes. Although the Danes reported a more frequent use of dental services, they had poorer dental conditions compared to the Swedes. Even though the Swedes used dental services less often than the Danes did, more subjects reported high 12-month out-of-pocket costs. In the present study, separate models were constructed for the two countries because there could be different mechanisms at play, as indicated by the results. The different insurance systems along with different degrees of commercialization in the two countries might be the most decisive factors in this context. □ *Dental care systems; dental status; questionnaires; utilization*

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Utilization of dental health services is defined in different ways in the literature (1–3). The most common measures are the number of annual dental visits per person and the share of citizens visiting a dentist within a year. The quality and quantity of services provided are seldom directly measured (2). Reports concerning the European countries, the United States and Canada show high and increasing frequencies of visits to dental care (2–5). However, frequencies among older people and people living in rural areas are reported to be lower than among younger people and those living in urban areas (6–10). Results from several studies indicate that individuals who regularly visit a dentist have more teeth, less untreated caries, and a higher number of restored teeth compared to individuals who visit the dentist mainly for symptomatic reasons (3, 6–11). Furthermore, the influence of dental insurance systems on oral health care is obvious (8, 10, 12).

Despite the development of fairly sophisticated models of utilization of dental care, there is a fundamental and unresolved issue: namely the causal relations between care utilization and dental health. It is not self-evident that high utilization leads to good dental conditions; the situation may well be the reverse. There are hypotheses about the influence of routine examinations, iatrogenic factors and even about economic factors related to the dentists, so-called supplier-induced demands (13). It is therefore important to carefully design studies analyzing the relation between dental care and dental conditions. As a first step towards this general objective, the aims in the present study were: 1) to assess differences in the utilization of dental services, and 2) to compare the private costs for dental care among middle-aged people in two countries, Sweden and Denmark, with control for age, gender, dental conditions, and income.

Materials and methods

In 1999, two parallel questionnaire studies were performed in Sweden and Denmark. Random samples were taken from the national population registers in the two countries. The Swedish sample comprised 1001 subjects aged 55–79 years and the Danish sample 1175 subjects aged 45–69 years. The sample subjects were requested to fill out questionnaires; these were as identical as possible given, among other things, the differences in languages between the countries. The design of the study has been presented earlier along with an analysis of the non-response (14). For both Swedish and Danish subjects, the responders and non-responders were compared with regard to gender and age. Among the Danes, no statistically significant difference was found. In the Swedish material, no significant difference was found between the genders, but the non-responders were older ($P < 0.001$). In the age group 55–69 years, however, there was no significant difference between responders and non-responders related to age or gender. Non-response was thus concentrated to the oldest age group.

The questionnaire contained various types of questions regarding dental conditions, frequencies of dental visits,

Table 1. Distribution of answers to the questionnaire question: 'When were you latest examined by a dentist?' Responses in percentage figures

	Total sample		Comparable age groups	
Response options	Sweden 55–79 years ($n = 661$)	Denmark 45–69 years ($n = 826$)	Sweden 55–69 years ($n = 453$)	Denmark 55–69 years ($n = 447$)
'Less than one year ago'	81	87	82	86
'About one to three years ago'	10	5	11	5
'About three to five years ago'	2	2	2	2
'More than five years ago'	5	3	5	4
'Have not been examined'	1	1	1	3
'Don't remember'	1	1	—	—

$\chi^2 = 19.31$, 5 df, $P < 0.0017$.
$\chi^2 = 20.18$, 4 df, $P < 0.0005$.

and the amount of money spent annually on dental care, etc. Two questions were aimed at measuring utilization of dental health services: 'When were you last examined by a dentist?', and 'How often do you attend dental services (including services by a hygienist or dental assistant)?' The response options for the first question were 'less than one year ago', 'one to three years ago', 'three to five years ago', 'more than five years ago', 'have not been examined', and 'don't remember'. The response options for the second question were 'two or more times per year', 'once a year', 'every second year', and 'seldom'.

To evaluate the financial aspect of utilization of dental services, the following question was included: 'Roughly, how much money have you paid for your dental care during the past 12 months'? The response options were 'nothing', 'less than 300 SEK/DK', '300–1000 SEK/DK', '1001–2000 SEK/DK', '2001–5000 SEK/DK', 'more than 5000 SEK/DK'. At the time of the study, 1 US$ = 8.50 SEK or 7.25 DK. All three questions were used as dependent variables in logistic regression models in binary form, where they were dichotomized. The cut points are stated in the tables. The following items were used as independent variables:

- *Income* in 8 categories: <100 000 SEK/DK, 101 000–150 000 SEK/DK, 151 000–200 000 SEK/DK, 201 000–250 000 SEK/DK, 251 000–300 000 SEK/DK, 301 000–350 000 SEK/DK, 351 000–400 000 SEK/DK, >401 000 SEK/DK. This was coded and used as a continuous variable with each category as a unit on the scale.
- *Dental conditions* in 7 categories: 'all teeth remaining', 'all

Table 2. Distribution of reported use of dental services for the different dental condition categories. Responses in percentage figures

	Response options				
Dental conditions	'Two or more times a year'	'Once a year'	'Every second year'	'More seldom'	*P*-value
All teeth remaining					
Sweden ($n = 116$)	21	69	6	4	0.0001
Denmark ($n = 245$)	85	13	1	2	
All missing teeth replaced with fixed prosthodontics					
Sweden ($n = 80$)	48	44	4	5	0.0037
Denmark ($n = 28$)	86	7	4	4	
One or two single teeth missing and not replaced					
Sweden ($n = 216$)	29	64	4	2	0.0001
Denmark ($n = 197$)	82	11	1	7	
Several teeth missing not replaced					
Sweden ($n = 87$)	31	51	9	9	0.0001
Denmark ($n = 151$)	81	13	2	4	
Wearing removable partial denture(s)					
Sweden ($n = 48$)	29	50	8	13	0.0001
Denmark ($n = 90$)	83	11	1	4	
Totally edentulous in one jaw					
Sweden ($n = 42$)	19	57	12	12	0.0004
Denmark ($n = 53$)	57	23	4	17	
Totally edentulous in both jaws					
Sweden ($n = 37$)	5	8	—	87	0.2004
Denmark ($n = 47$)	6	11	11	72	
All Subjects					
Sweden ($n = 654$)	28	56	6	11	0.0001
Denmark ($n = 823$)	77	13	2	9	

Table 3. Distribution of 12-month out-of-pocket costs for dental care among the subjects. Responses in percentage figures

	Total sample		Comparable age groups	
Response options	Sweden 55–79 years ($n = 655$)	Denmark 45–69 years ($n = 826$)	Sweden 55–69 years ($n = 450$)	Denmark 55–69 years ($n = 441$)
'Nothing'	12	10	10	11
'Less than 300 SEK/DK'	3	14	2	11
'300–1000 SEK/DK'	44	48	43	48
'1001–2000 SEK/DK'	19	13	18	15
'2001–5000 SEK/DK'	15	8	17	8
'More than 5000 SEK/DK'	8	7	9	7

$\chi^2 = 78.75$, 5 df, $P < 0.001$.
$\chi^2 = 41.98$, 5 df, $P < 0.001$.

missing teeth replaced with fixed prosthodontics', 'one or two single teeth missing and not replaced', 'several teeth missing and not replaced', 'wearing removable partial denture(s)', 'totally edentulous in one jaw', 'totally edentulous in both jaws'. The first three dental categories ('all teeth remaining', 'all missing teeth replaced with fixed prosthodontics', and 'one or two single teeth missing and not replaced') were together labelled 'good dental conditions'.

- *Age* in years.
- *Gender*.

Statistical methods

The χ^2 test was used for bivariate statistical analysis. For multivariate analysis, logistic regression analysis was used since the dependent variable was binary. For assessment of goodness-of-fit, the χ^2 model was calculated as well as the number of correctly predicted cases. Statistical significance was set as $P < 0.05$. All data analysis was done in SPSS.

Results

More than 80% of the subjects in Sweden and Denmark reported that a dentist had examined them less than one year previously (Table 1). Only about 1% of the subjects in both countries stated that they had not been examined. With the exception of the totally edentulous subjects, great differences were seen between the total Swedish and Danish samples concerning reported use of dental services (Table 2). The most obvious differences were seen between those with all teeth remaining. Compared to the Swedes, there were 4 times as many Danes reporting use of dental services twice or more times per year (Table 2). Similar patterns were observed for the other groups. A total of 77% of the Danes reported dental visits twice a year or more often, compared to 28% of the Swedes.

The Swedes reported a significantly higher 12-month out-of-pocket cost for dental care compared to the Danes (Table 3). About 10% of the subjects in both countries did not report any costs.

Logistic regression analyses were performed separately for the two countries and revealed similar patterns when 'latest visit to dentist less than one year ago' was set as the dependent variable (Table 4). Among those who reported good dental conditions, the probability of being examined by a dentist less than one year previously was more than 2.5 times higher compared with the others in both countries. Also income showed a strong association with this dependent variable in both models.

In the model of use of dental services, different patterns were seen in the two countries (Table 5). For the Danes with good dental conditions, the probability of visiting dental services twice a year or more was 2.3 times higher compared to the others. Here, too, income displayed a strong association in both countries.

When out-of-pocket costs for dental services were set as the dependent variable, different patterns were seen for the Swedish and Danish subjects. For the Swedes, higher

Table 4. Logistic regression model with 'latest visit to dentist less than a year ago compared to the others' as the dependent variable, odds ratios and *P*-values given

Independent variables	Sweden ($n = 557$)	*P*-value	Denmark ($n = 781$)	*P*-value
Age (in years)	1.018	0.300	1.026	0.161
Gender				
(Male ref. category)	—	—	—	—
Female	1.538	0.077	1.590	0.043
Dental conditions				
(Others ref. category)	—	—	—	—
Good dental conditions	2.531	0.001	2.987	0.001
Income (8 categories)	1.251	0.010	1.328	0.001

Model χ^2: 28.53 4 df, $P = 0.001$. Percent correctly classified cases 81.0.
Model χ^2: 52.33, 4 df, $P = 0.001$. Percent correctly classified cases 87.1.

Table 5. Logistic regression model for 'frequency of visit to dental services, twice a year or more compared to the others' as the dependent variable, odds ratios and *P*-values given

Independent variables	Sweden ($n = 555$)	*P*-value	Denmark ($n = 777$)	*P*-value
Age (in years)	1.012	0.398	1.037	0.013
Gender				
(Male, ref. category)	—	—	—	—
Female	1.127	0.572	1.286	0.173
Dental conditions				
(Others, ref. category)	—	—	—	—
Good dental conditions	1.479	0.074	2.276	0.001
Income (8 categories)	1.138	0.039	1.197	0.001

Model χ^2: 40.829, 4 df, $P = 0.06$.
Percent correctly classified cases 77.2.

income and female gender were significantly associated with higher costs, while in the Danish model only increasing age showed a significant association (Table 6).

Discussion

The most striking finding was the more frequent use of dental services among the Danes despite their poorer dental conditions compared to the Swedes (15). With the exception of those who were edentulous, the Danes reported a 2–4 times more frequent use of dental services compared to the Swedes. It is not very likely that the differences between the countries could be explained by more Danes than Swedes visiting dental hygienists, since the hygienist/dentist ratio is much higher in Sweden than in Denmark, 0.36 compared to 0.20 (16). Earlier, when comparing use of dental services in the Scandinavian countries, the studied variable was 'dental visits once a year or more often' (17). No major differences were noted. The finding of the present study was the same in this respect. However, when splitting this response option into two alternatives, 'once a year' and 'two or more times a year', an obvious difference between Sweden and Denmark was revealed.

Even if the Swedes used dental services more seldom than the Danes did, more subjects reported higher 12-month out-of-pocket-costs (Table 3). It should be remembered that the figures show frequency of dental visits and out-of-pocket costs, not the amount of dental treatment.

A possible explanation could be that the two countries have different insurance systems. In Sweden, there is a general and all-encompassing dental insurance system, while in Denmark only a few items, such as tooth extractions, fillings, and preventive care, are included in the general health insurance system. Thus, all prosthodontic treatments in Denmark have to be paid by the patients themselves. For example, a 5-unit fixed partial denture in Sweden will cost the patient about half the cost in Denmark. It is therefore likely that more Swedes than Danes choose expensive fixed prosthodontic restorations, because this treatment is subsidized by the national insurance system in Sweden but not in Denmark. It has also been shown that less expensive prosthodontic treatment, such as removable partial dentures, is more common in Denmark than in Sweden (15).

However, this might appear contradictory. Danes attend dental care more frequently but have poorer dental conditions than Swedes. Yet in both countries and in comparable age groups good dental conditions were found to be positively associated with the frequency of visits to dental services, as in other studies (3, 6–11). This finding illustrates the complexity of the relation between care utilization and dental conditions, making a more thorough analysis needed.

In the multivariate regression analyses, different results were seen for the two countries. An interesting finding was that only in the Danish sample was increasing age significantly associated with both more frequent visits to dental services and higher out-of-pocket costs (Tables 5, 6).

Table 6. Logistic regression model for 'paid >1000 SEK/DK out-of-pocket costs in last 12 months for dental care compared to the others' as the dependent variable, odds ratios and *P*-values given

Independent variables	Sweden ($n = 554$)	*P*-value	Denmark ($n = 780$)	*P*-value
Age (in years)	0.991	0.481	1.036	0.008
Gender				
(Male ref. category)	—	—	—	—
Female	1.701	0.007	1.299	0.132
Dental conditions				
(Others ref. category)	—	—	—	
Good dental conditions	1.359	0.120	0.810	0.229
Income (8 categories)	1.195	0.003	1.076	0.107

Model χ^2: 21.156, 4 df, $P \leq 0.001$.
Percent correctly classified cases 59.4.

More frequent visits to dental services could, of course, automatically lead to higher out-of-pocket costs. The improved conditions in dental care among people in the Scandinavian countries imply that the volume of radical treatment services, such as tooth extractions and extensive prosthodontic treatments, has declined, while the number of people who visit dental services for preventive reasons has increased (18). Different traditions in the two countries regarding recall routines may also be a possible explanation of differences in care utilization as well as system differences such as the presence of denturists in Denmark but not in Sweden. Furthermore, the fact that there are two different dental delivery systems of about the same size in Sweden, private and public, may also explain some of the differences. Traditionally, many older people in Sweden regularly attend the Public Dental Health System where the economic incentives for the suppliers have been less obvious compared to the private care system.

As noted above, the present results mainly verify earlier findings that those with good dental conditions utilize dental services more often than others whose conditions are not so good also when controlling for some well-known confounders (3, 6–11). However, a causal relationship between dental visits and dental conditions cannot be concluded from the present data.

The strong relation in both countries between utilization and income should be noted. A possibility is that dental care is regarded as a consumption commodity more than as a treatment of diseases or rehabilitation after diseases. As those with a high income generally consume more than those with a low income, this might also be true for dental care. There may very well be differences between Swedish and Danish dental care in this respect. The large Public Dental Health Service in Sweden may limit the tendencies to regard dental care as a consumption item, even though this difference may shrink with the increasing commercialization of Swedish dental care (19).

Regarding the number of dental visits, it has been shown that the self-reported figures are a little higher than the true figure (20). However, there is no reason to believe that there should be a difference between Sweden and Denmark in reporting the number of dental visits. Besides, in multivariate analyses, it is the associations between variables, not the precise levels, that are the most important.

In the present study, separate models were constructed for the two countries. The main reason was that there might be different mechanisms at play, as indicated by the results. The different insurance systems, together with different degrees of commercialization, in the two countries might be the most decisive factors in this context. Including 'country' as a variable in a global model would obfuscate such differences. This does not imply that the models here are fully specified, as they include only a few well-known confounders. The models will therefore be further developed in future studies.

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