

# Influences of some background factors on the subjective need for dental implants in a Swedish population

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On the basis of a questionnaire sent to 3000 randomly sampled individuals aged 45-69 years and living in an average Swedish county (response rate, 79.4%), the influences of some demographic, socioeconomic, and attitude variables on the subjective need for treatment with dental implants were studied in stepwise logistic regression models. The overall influence of these background factors was rather limited. Instead, the most important single factor seemed to be dental status. For the subjects wearing removable partial dentures, low education was significantly related to a low subjective need for implant treatment. For the totally edentulous group of subjects, low income was most significantly associated with a low subjective need for implant therapy. □ *Dental implants; multivariate analysis; public health; treatment need*

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There are several reports on patient satisfaction with dental implants and on the selection criteria for such treatment (1-5). The subjective need for treatment with dental implants has only recently been investigated, and limited information is available (6-8). As could be expected, reported figures indicate that the subjective need for implant treatment is lower in the general population than in prosthodontic patient groups. The need and demand for treatment with dental implants is of course influenced by several factors, such as recognition of treatment possibility, treatment availability, and treatment costs.

In a previous report (8) based on a questionnaire study of 3000 individuals aged 45-69 years and living in Örebro County, Sweden, it was noted that the totally edentulous subjects showed the lowest subjective need for implant dentistry. Subjects with better dental conditions showed a higher subjective need for such treatment. The highest percentage figure was noted for the hypothetical need in the group with all teeth remaining. The main reason for not wanting

treatment with dental implants was satisfaction with dental conditions and dentures. The costs for implant treatment, which are moderate in the Swedish dental insurance system, seemed to be of less importance, although not unimportant. Given these results, the aim of the present study was to analyze the importance of various demographic, socioeconomic, and attitude variables in relation to the expressed subjective need for dental implants in various dental categories.

## Materials and methods

A questionnaire was sent to 3000 randomly selected inhabitants aged 45-69 years in Örebro County, which is socially and economically an average Swedish county. The response rate was 79.4%. The validity of the answers given by the subjects with regard to their dental conditions was quite satisfactory (9). Variations in dental conditions appeared closely related to demographic and socioeconomic conditions (10, 11).

The questionnaire included adequate information about dental implants, treatment procedures, and treatment costs (8). Depending on their reported dental conditions, the subjects were in the same questionnaire (using so-called 'filters') asked different questions about their subjective need for dental implants:

Subjects reporting 'missing teeth not replaced' were asked, 'Do you want your missing teeth replaced by dental implants, if such treatment is possible?'. Subjects reporting 'presence of removable denture(s)' were asked, 'Do you, instead of your removable denture(s), want dental implants if such treatment is possible?'. In both cases, two response alternatives were given: 'yes' and 'no'. No 'don't know' option was given. The percentages of different answers to the somewhat different questions are shown in Table 1.

Subjects reporting 'all teeth remaining' were hypothetically asked, 'If you would lose one or two of your teeth, what type of dental treatment would you prefer?'. The response alternatives and distribution of answers were 'conventional fixed partial denture (bridge)', 40%; 'removable partial denture', 1%; 'dental implant', 51%; and 'no treatment', 1%. No 'don't know' option was given. The non-response rate was 7%.

The influence of some background factors on the reported subjective need for treatment with dental implants was studied in stepwise multiple logistic regression models. Separate models were constructed for five different dental conditions, described in detail earlier (8): all teeth remaining; missing

teeth not replaced; wearing removable partial denture(s) (RPDs); totally edentulous in one arch; and totally edentulous in both arches. The answers by the subjects in these dental categories were used as dependent variables in the models. The independent variables were the same as the ones used earlier for models explaining variations in dental conditions (11). When selecting the independent variables, the risk of multicollinearity was considered, excluding highly intercorrelated variables. The following variables were included: age (45-49 years; 50-54 years; 55-59 years; 60-64 years; 65-69 years); gender (male; female); marital status (married; other status); place of residence (city; village or rural); education (short, up to 9 years of schooling; middle or long, more than 9 years), individual income (subjects grouped in quartiles: 0-84,000 SEK; 85,000-120,000 SEK; 121,000-150,000 SEK; 151,000- SEK before taxes); dental appearance (the importance of good dental appearance: unimportant or less important; important or very important); dental function (importance of good dental function: unimportant or less important; important or very important).

The two last variables are attitude variables, constructed after a factor analysis of a battery of seven attitude items (12).

## Results

Separate multivariate models were constructed for each subgroup. All eight independent variables were included in the

Table 1. Percentages of subjects in the various dental categories answering 'yes' or 'no' to different questions about their subjective need for dental implants and the percentages of non-responders

	Missing teeth not replaced (n = 968)	Wearing removable partial denture(s) (n = 166)	Totally edentulous in the maxilla or the mandible (n = 173)	Totally edentulous in both the maxilla and the mandible (n = 207)
Yes	21	23	17	8
No	50	56	46	39
Non-response	29	21	38	54

Table 2. A stepwise logistic regression model for the group of subjects with missing teeth not replaced. The answers 'yes'/'no' to the question about their subjective need for treatment with dental implants is used as the dependent variable. Relative risks for the 'no' answer expressed as odds ratios with 95% confidence intervals

Independent variables	Multivariate odds ratios	95% confidence intervals for multivariate odds ratios
<b>Dental function</b>		
Unimportant or less important (ref. cat.)	—	
Important or very important	1.20	1.11–1.30
<b>Residence</b>		
City (ref. cat.)	—	
Village or rural	1.44	1.22–1.71

Other variables insignificant. Intercept, -0.11. Predictive value for the model, 70.2% correctly predicted; -2 log likelihood chi-square = 851.2; df = 705; *p* = 0.001.

construction of the models, but only those variables showing significant relationships with the dependent variables are stated in the tables. The variables are listed in the order in which they entered the stepwise regression equations, mirroring their explanatory importance for the dependent variables, with all other variables controlled.

For subjects with missing teeth not replaced (Table 2), the variables considering dental function important and having rural residence were related to a low subjective need for dental implants. However, both variables had relatively low odds ratios.

For subjects wearing removable partial denture(s), education was the only signifi-

cant independent variable (Table 3), with low education giving a low expressed need for dental implants. The odds ratio was high (6.75) but had a wide confidence interval owing to the material size. The model almost reached significance at the 10% level.

For subjects who were totally edentulous either in the maxilla or in the mandible, none of the tested independent variables was significantly related to the dependent variable.

For totally edentulous subjects (Table 4), low income had a very strong association with low subjective need for dental implants. Further, there was a significant difference between the genders, females showing the

Table 3. A stepwise logistic regression model for the group of subjects wearing removable partial denture(s). The answers 'yes'/'no' to the question about their subjective need for treatment with dental implants used as the dependent variable. Relative risks for the 'no' answer expressed as odds ratios with 95% confidence intervals

Independent variables	Multivariate odds ratios	95% confidence intervals for multivariate odds ratios
<b>Education</b>		
Middle or long (ref. cat.)	—	
Short	6.75	3.57–13.92

Other variables insignificant. Intercept, 3.01. Predictive value for the model, 74.4% correctly predicted; -2 log likelihood chi-square = 146.5; df = 127; *p* = 0.1135.

Table 4. A stepwise logistic regression model for the group of subjects who were totally edentulous. The answers 'yes'/'no' to the question about their subjective need for treatment with dental implants used as the dependent variable. Relative risks for the 'no' answer expressed as odds ratios with 95% confidence intervals

Independent variables	Multivariate odds ratios	95% confidence intervals for multivariate odds ratios
<b>Income</b>		
151,000- SEK (ref. cat.)	—	
121,000-150,000 SEK	0.18	0.09-0.34
85,000-120,000 SEK	0.67	0.39-1.16
-84,000 SEK	22.72	8.80-58.66
<b>Gender</b>		
Female (ref. cat.)	—	
Male	6.86	3.10-15.22

Other variables insignificant. Intercept, 4.02. Predictive value for the model, 84.2% correctly predicted; -2 log likelihood chi-square = 54.2; df = 71;  $p = 0.9309$ .

highest subjective need. The model as a whole was not significant owing to the small material.

The subjects with all teeth remaining were asked a hypothetical question on their choice

of replacement if they were to lose one or two of their teeth. The regression model for this group (Table 5) showed that high income, city residence, considering dental appearance important, and dental function

Table 5. A stepwise logistic regression model for the group of subjects reporting all teeth remaining. The answers (to the hypothetical question) 'dental implant' versus other alternatives used as the dependent variable. Relative risks for not choosing 'dental implant' expressed as odds ratios with 95% confidence intervals

Independent variables	Multivariate odds ratios	95% confidence intervals for multivariate odds ratios
<b>Income</b>		
151,000- SEK (ref. cat.)	—	
121,000-150,000 SEK	0.91	0.77-1.07
85,000-120,000 SEK	1.27	1.07-1.51
-84,000 SEK	1.45	1.20-1.76
<b>Dental appearance</b>		
Important or very important (ref. cat.)	—	
Less important or unimportant	1.30	1.19-1.42
<b>Dental function</b>		
Important or very important (ref. cat.)	—	
Less important or unimportant	0.82	0.75-0.90
<b>Residence</b>		
City (ref. cat.)	—	
Village or rural	0.65	0.53-0.80

Other variables insignificant. Intercept, 0.64. Predictive value for model, 59.6% correctly predicted; -2 log likelihood chi-square = 630.3; df = 473;  $p = 0.0000$ .

less important all had independent associations with expressing a hypothetical subjective need for dental implants. The model was strongly significant owing to the large material.

## Discussion

For the interpretation of the results, it is important for the reader to know something about implant dentistry in Swedish society. In the Swedish dental insurance system, the patient fees for treatment of a totally edentulous maxilla or mandible with an implant-supported prosthesis equals about 1.5 month's salary (before taxes) for a skilled worker. Implant treatment is not uncommon. In the studied population subjects in all age groups reported having dental implants, averaging 0.5% (10).

The overall influence of the studied demographic, socioeconomic, and attitude variables was rather limited. Their influence is presumably indirect, mediated through their effects on dental conditions. Earlier, a close relationship between socioeconomic conditions and dental categories has been reported in this population (10, 11). It was therefore not expected that the background factors would have a strong influence on the subjective need for dental implants in the different dental categories. It should be observed that in the models the influence of dental conditions on the subjective need for dental implants was controlled.

Age and marital status showed no significance in any of the models. For the totally edentulous group a relation between high age and low subjective need for implant treatment might have been suspected. But there was no clear age gradient for the subjective need in this group.

In the model for the subjects wearing RPDs, education was the only significant variable but with an odds ratio of 6.75. In the other models education was not significant. There has been a change in the prosthodontic service rates in Sweden towards more fixed partial dentures (FPDs) and less RPDs (13, 14). It is well known to the dental profession in Sweden that most patients today try to avoid removable dentures. In the

present study, the highest subjective need for implant dentistry was noted in the group of subjects wearing RPDs (Table 1). It seems reasonable to believe that well-educated subjects who had received their RPDs many years ago no longer are satisfied with this kind of prosthesis.

The lowest subjective need for treatment with dental implants was expressed by the totally edentulous group. This seems to be part of a consistent pattern in Scandinavia; total edentulousness is connected with low income and education levels and with a very low utilization of dental services (10, 11, 15-18).

In the present study the income variable was significantly related to the subjective need for implant dentistry among the totally edentulous subjects. Belonging to the lowest income group meant a relative risk multiplied by 22.72 for not wanting treatment with dental implants as compared with the reference category (the highest income group). Education, on the other hand, showed no statistical significance in the model with the totally edentulous subjects. There is an obvious reason for that result: there were only five totally edentulous subjects reporting more than 9 years of schooling! The significance of the gender variable in the model is interesting, since there was bivariately no significant difference. Obviously, there was a very close relationship between female sex and low income disguising the gender difference in subjective need for treatment with dental implants.

The subjects with all teeth remaining were asked hypothetically what kind of replacement they would prefer if they were to lose one or two of their teeth. In the model for this group there were four significant independent variables. But the odds ratios were quite low. Yet, from a clinical point of view the direction of the influence of the attitude variables was interesting: considering dental appearance important increased the hypothetical need for dental implants, and considering dental function important decreased the same hypothetical need.

Since the evidently most influential variable, dental condition, is controlled in the models for the subjects wearing removable

denture(s) and for those totally edentulous in both arches (Tables 3 and 4), the predictive values of the models are relatively low. Both subgroups, the subjects wearing RPDs and those totally edentulous, are so small that the overall model is not significant. That makes the clear results about the independent variables somewhat remarkable and even improves credibility.

Owing to the large size of the subgroup having all teeth remaining (Table 5) the model has very strong overall significance. The predictive value is, however, rather low, which may be ascribed to the hypothetical nature of the dependent variable.

To conclude, the overall influence in the present material of demographic, socio-economic, and attitude variables was found to be limited when controlling for dental conditions. However, for subjects who were totally edentulous or wearing RPDs, low income and low education, respectively, were most significantly associated with a low subjective need for treatment with dental implants.

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