Factors Explaining Desire for Dental Implant Therapy: Analysis of the Results from a Longitudinal Study

Birger Narby, LDS[a]/Ingrid Collin Bagewitz, DDS, PhD[b]/Björn Söderfeldt, PhD, DrMedSc[c]

Purpose: The aim of this research was to investigate possible factors behind the desire for and changes in attitude toward implant treatment in a population of middle-aged and older individuals in Sweden. ***Materials and Methods:*** In 1989 and 1999, questionnaires were sent to 3,000 residents in Örebro County, Sweden. Response rates were 79% and 68%, respectively. Those responding to both questionnaires yielded a longitudinal study panel. Logistic regression models were done with "desire of implant treatment" and "changes in desire of implant treatment" as dependent variables. ***Results:*** Older people, non-city residents, and those with one or several missing and unreplaced teeth changed their desire for implant treatment between study years. Effects of age, residence, and better dental status disappeared during the 10-year study period. Those who were edentulous and those with removable dentures (pseudo R^2: 0.17) expressed lower desire for treatment than those with all teeth remaining or only one or a few teeth missing (pseudo R^2: 0.24) in 1989. High income significantly increased the probability to desire implant treatment for the study panel at both study occasions (P = .016 and P = .034 for 1989 and 1999, respectively). ***Conclusions:*** Factors influencing desire for implant treatment were primarily income and dental status. The influence of young age, urban living, and dental status regarding the subgroup with one or several teeth missing in relation to those with all their teeth disappeared during the 10-year study period. *Int J Prosthodont 2011;24:437–444.*

In recent decades, treatment with dental implants has been established as the most important component in the range of prosthodontic treatment. Dental implants have made dramatic improvements in oral rehabilitation possible, especially for edentulous individuals.

The need and demand for prosthetic treatment, especially implant treatment, has at the same time, and in line with the development of society, changed for many individuals. In most Western societies, a shift into a demand-driven approach in health care is being witnessed.[1] The overall desire for better oral health–related quality of life has become a reality in prosthetic dentistry, although studies indicate that need as assessed by dentists overestimates the rehabilitation need in comparison with assessment by patients.[2,3]

Analysis of changes in need and demand for implant treatment is of great interest because of changes in society and the differences in need assessment between patients and dentists, but to the authors' knowledge, this has not been researched in longitudinal studies. According to a previous study based on two questionnaires, there was, over the course of a decade, a dramatic escalation in interest of implant treatment. At the time of the second survey, 95% of participants expressed desire for implant treatment in comparison with 39% in the first survey.[4] The objective of the present study was to construct multivariate models to find possible factors explaining desire for implant treatment and possible factors explaining the change in desire for implant treatment over the 10-year study period.

Materials and Methods

Two questionnaire studies were performed, one in 1989 and the other in 1999, with the intention of evaluating desire for implant treatment among the same 3,000 subjects aged 45 to 69 years in Örebro County,

[a]*Senior Consultant, Department of Prosthetic Dentistry, Public Dental Health Service, Uppsala, Sweden.*
[b]*Senior Consultant, Department of Prosthetic Dentistry, Public Dental Health Service, Malmö, Sweden.*
[c]*Professor and Chair, Department of Oral Public Health, Malmö University, Malmö, Sweden.*

Correspondence to: *Dr Birger Narby, Department of Prosthetic Dentistry, Public Dental Health Service, Box 1813, S-751 48 Uppsala, Sweden. Fax:+46 18 692947. Email: birger.narby@lul.se*

Sweden. Participants who responded in both 1989 and 1999 constituted the panel used in the present study and accounted for 56% of the total survey sample in 1989. The study group has been presented in previous publications.[5,6] A nonresponse analysis was presented previously. When comparing those who responded only in 1989 with those participating in both 1989 and 1999, there were significant differences between the groups. Subjects who responded on both occasions compared to those who responded only in 1989 were younger, had a higher level of education, and reported better dental status, ie, fewer participants wore removable dentures. Internal nonresponse varied for different questions, which means different n values for different analyses. Among those responding in both 1989 and 1999, however, no significant differences in dental conditions were noted between nonresponse groups and other subjects.[7]

The questionnaire, among other things, aimed at measuring dental conditions and opinions regarding dental implants and gaining information about demographics, social structure, oral health–related quality of life, desire for various types of prosthodontic treatment, and psychologic factors of interest. The variables used in the questionnaire were published previously.[5] The validity of answers with regard to dental conditions was analyzed in a previous study.[8]

Questions related to the subjects' dental conditions and desire for implant treatment were posed. Participants missing one or more teeth not being replaced and those completely edentulous with or without removable dentures were, in the present study, considered as having a possible treatment need. A hypothetical demand in this study is described as desire for implant treatment. The following questions were addressed to gauge desire for implant treatment:

- You, who are missing teeth in one arch, totally or partially, would you in general prefer treatment with dental implants, if possible? (yes, no, uncertain)
- You, who are missing some teeth and have a removable partial denture, would you instead prefer treatment with dental implants, if possible? (yes, no, uncertain)
- You, who are missing all of your own teeth in one or both arches with or without removable denture(s), would you instead prefer treatment with dental implants, if possible? (yes, no, uncertain)
- If you, who have all of your own teeth left, would lose one or a few teeth, what treatment would you prefer? (four choices, with implants as one of them)
- If you, who have all of your own teeth left, would lose all of your teeth in one arch, what treatment would you prefer? (four choices, with implants as one of them)

The questions aimed to address respondents with various types of dental statuses.

Those who responded that they would choose dental implants were considered as having a possible desire for such treatment.[4] Choosing dental implants was set as the dependent variable in the regression models.

The following variables from the questionnaires were used as independent variables in the present study:

- Age in years (three categories): 45 to 49 years, 50 to 59 years, 60 to 69 years (in 1989)
- Individual income (divided into eight equidistant groups): < 100,000 SEK, 101,000 to 150,000 SEK, 151,000 to 200,000 SEK, 201,000 to 250,000 SEK, 251,000 to 300,000 SEK, 301,000 to 350,000 SEK, 351,000 to 400,000 SEK, > 401,000 SEK
- Sex: male, female
- Marital status: married and cohabitants, single
- Education: low (≤ 9 years), medium (10 to 12 years), high (> 12 years)
- Place of residence: city, village or rural
- Dental status (in four categories): all teeth left, ie, all teeth remaining or all missing teeth replaced by fixed partial dentures (better dental status); one or several teeth missing, ie, one or several teeth missing and not replaced by fixed partial dentures (medium dental status); removable denture, ie, wearing removable partial denture(s) and not edentulous in any arch (bad dental status); completely edentulous in one or both arches, ie, edentulous in one or both arches and wearing or not wearing a denture (bad dental status)
- Dental care delivery system: private practice, public dental health system

Frequencies for the different variables are shown in Table 1. Internal nonresponse varied for different questions, listwise deletion of missing data, which means different n values for different questions. The frequencies were calculated from the questionnaire in 1989 since they changed little during the period. Implant desire, however, was calculated from the questionnaire in 1999 because these values were relevant for the present study.

There were also two attitudinal scales, in seven steps, that were dichotomized in the analysis[9]: importance of dental function (unimportant to important)

Table 1 Frequency Distribution of Respondents in 1989 and Implant Desire in 1989 and 1999

	%	n	n (total)	Total non-respondents
Sex				
Men	48	1,136		
Women	52	1,247	2,383	617
Education				
< 9 y	75	1,761		
10–12 y	11	265		
> 12 y	14	326	2,352	648
Marital status				
Single	79	1,877		
Other	21	491	2,368	632
Place of residence				
City	56	1,332		
Rural	44	1,042	2,374	626
Dental category				
All teeth remaining	34	794		
One or several teeth missing	43	1,007		
Removable denture(s)	7	166		
Completely edentulous in one or both arches	16	380	2,347	653
Dental care delivery system				
Private practice	79	1,749		
Public dental health service	21	472	2,221	779
Implant desire (1989)				
No	68	1,614		
Yes	32	769	2,383	617
Implant desire (1999)				
No	5	79		
Yes	95	1,384	1,463	1,537

Table 2 Frequency Distribution of Respondents in 1989 for Age, Income, and Attitude

		Mean	SD	n (total)	Total non-respondents
Income	8 equidistant steps	5.42	2.84	2,112	888
Age	Continuous	57.70	7.55	2,383	617
Importance of dental function	7 steps	2.91	1.64	2,241	759
Importance of good dental appearance	7 steps	4.37	1.91	2,053	947

SD = standard deviation.

and importance of good dental appearance (unimportant to important). These scales are shown in Table 2 together with the variables for age and income.

Statistical Analysis

Three different logistic models were used to analyze the responses for those participating in 1989 and in 1999 and for analysis of the differences in responses between those who participated in both 1989 and 1999.[10] The effect of independent variables was expressed as odds ratios. Nagelkerke (pseudo) R^2, classification plots, and correctly predicted cases were calculated for determination of goodness of fit of the models. The same model was used for analysis of nonresponders (individuals who did not respond to the question who desired implants). Frequency distributions were calculated for the various measures. The statistical significance of differences was determined using the Pearson chi-square test with $P < .05$ as the significance level. All calculations were completed using SPSS 11.0 (SPSS).

Results

A logistic regression model was constructed with the dependent variable as respondents stating a desire, in contrast to those without a desire, for implant treatment in 1989. It showed a significantly higher probability for desire of implant treatment for the independent variables "higher income," "younger age," "better dental status," "urban living," and "concern for a good dental appearance" (Table 3). Income had the strongest association with desire for implant treatment. There was a 7% higher probability to desire implant treatment between each of the 8 equidistant groups, giving a total 56% higher probability to desire implant treatment for those with the highest level of income than for those with the lowest level.

An association between desire for implant treatment and dental status was, however, not expected. Those with a higher "objective" need, ie, those with removable dentures and those who were edentulous, had a lower probability of desiring implant treatment than all other categories of dental status (Table 3).

A logistic regression model was constructed for the population responding in 1999 with the dependent variable as respondents desiring implant treatment in contrast to others (Table 4). High income still increased the probability to desire implant treatment for the total population. There was also no change in association as to dental status. However, there was a change in desire for implant treatment for

Table 3 Logistic Regression Model With Respondents Stating a Desire for Implant Treatment in Contrast to Those Without a Desire for Implant Treatment in 1989 as the Dependent Variable

	Total		a		b	
Independent variables	OR	*P*	OR	*P*	OR	*P*
Income (8 equidistant steps)	1.07	.016	1.05	.090	1.16	.039
Sex (female; male ref cat)	1.10	.459	1.07	.656	1.31	.419
Single (married or cohabitant ref cat)	1.01	.964	1.00	.997	1.01	.980
Education (< 9 y ref cat)						
10–12 y	1.10	.580	0.84	.294	0.58	.518
> 12 y	1.16	.364	0.91	.633	1.01	.993
Age (y) (continuous)	0.96	.000	0.97	.000	0.95	.014
Place of residence (city ref cat)	0.77	.029	0.81	.096	0.57	.052
Dental status (all teeth left ref cat)						
One or several teeth missing	0.28	.000	0.28	.000		
Removable denture(s)	0.37	.000			0.75	.340
Completely edentulous in one or both arches	0.24	.000				
Public dental care delivery system (private practice ref cat)	0.87	.318	1.03	.879	0.41	.014
Importance of dental function (7 steps)	1.05	.142	1.05	.187	1.06	.478
Importance of dental appearance (7 steps)	1.07	.035	1.07	.036	1.03	.713

Total: n = 1,691 (nonrespondents = 1,309); a = respondents with all teeth remaining or missing teeth replaced by fixed prosthodontics or not replaced at all (n = 1,336, nonrespondents = 465); b = respondents wearing removable partial denture(s) or edentulous in one or both arches (n = 355, nonrespondents = 191); OR = odds ratio; ref cat = reference category.
Total: correctly predicted cases: 71.4%, 7.2% improvement; model $\varkappa^2$: 274.9, $P < .001$, 13 *df*; Nagelkerke R^2: 0.21.
a: correctly predicted cases: 68.9%, 9.0% improvement; model $\varkappa^2$: 195.2, $P < .001$, 11 *df*; Nagelkerke R^2: 0.18.
b: correctly predicted cases: 80.6%, 0% improvement; model $\varkappa^2$: 36.0, $P < .001$, 11 *df*; Nagelkerke R^2: 0.15.

Table 4 Logistic Reression Model With Respondents Stating a Desire for Implant Treatment in Contrast to Those Without a Desire for Implant Treatment in 1999 as the Dependent Variable

	Total		a		b	
Independent variables	OR	*P*	OR	*P*	OR	*P*
Income (8 equidistant steps)	1.16	.034	1.21	.025	1.00	.995
Sex (female; male ref cat)	1.82	.086	1.98	.116	1.79	.413
Single (married or cohabitant ref cat)	0.83	.608	0.80	.597	1.02	.979
Education (< 9 y ref cat)						
10–12 y	1.13	.805	0.64	.434	12.67	.029
> 12 y	0.98	.990	1.69	.551	5.71	.214
Age (y) (continuous)	1.01	.695	1.03	.269	0.95	.276
Place of residence (city ref cat)	1.08	.792	1.05	.902	1.34	.606
Dental status (all teeth left ref cat)						
One or several teeth missing	0.78	.504	0.80	.510		
Removable denture(s)	0.21	.002			0.37	.104
Completely edentulous in one or both arches	0.11	.000				
Public dental care delivery system (private practice ref cat)	0.69	.255	1.42	.488	0.22	.010
Importance of dental function (7 steps)	1.06	.561	1.14	.305	0.90	.557
Importance of dental appearance (7 steps)	1.11	.164	1.08	.398	1.12	.430

Total: n = 1,023 (nonrespondents = 1,977). a = respondents with all teeth remaining or missing teeth replaced by fixed prosthodontics or not replaced at all (n = 980, nonrespondents = 881). b = respondents wearing removable partial denture(s) or edentulous in one or both arches (n = 103, nonrespondents = 443); OR = odds ratio; ref cat = reference category.
Total: correctly predicted cases: 94.5%, 0% improvement; model $\varkappa^2$: 53.9, $P < .001$, 13 *df*; Nagelkerke R^2: 0.15.
a: correctly predicted cases: 96.4%, 0% improvement; model $\varkappa^2$: 14.2, $P < .001$, 11 *df*; Nagelkerke R^2: 0.06.
b: correctly predicted cases: 81.6%, 3.9% improvement; model $\varkappa^2$: 17.6, $P < .001$, 11 *df*; Nagelkerke R^2: 0.24.

Table 5 Logistic Regression Model with the Change of Desire for Implant Treatment from 1989 to 1999 as the Dependent Variable

Independent variables	b	OR	*P*
Income (8 equidistant steps)	0.01	1.01	.740
Sex (female; male ref cat)	0.11	1.12	.501
Single (married or cohabitant ref cat)	−0.10	0.91	.589
Education (< 9 y ref cat)			
10–12 y	−0.07	0.93	.715
> 12 y	−0.25	0.78	.204
Age (y) (continuous)	0.03	1.04	.001
Place of residence (city ref cat)	0.31	1.36	.035
Dental status (all teeth left ref cat)			
One or several teeth missing	1.39	4.01	.000
Removable denture(s)	0.50	1.65	.135
Completely edentulous in one or both arches	−0.05	0.95	.875
Public dental care delivery system (private practice ref cat)	−0.01	1.00	.988
Importance of dental function (7 steps)	−0.03	0.97	.476
Importance of dental appearance (7 steps)	−0.02	0.98	.552

Total: n = 1,012 (nonrespondents = 1,988); OR = odds ratio; ref cat = reference category.
Correctly predicted cases: 66.9%, 13.3% improvement; model χ^2: 140.09, $P < .001$, 13 *df*; Nagelkerke R^2: 0.17.

Table 6 Logistic Regression Model Regarding Nonrespondents of the Question on Implant Desire in 1999 in Contrast to Respondents of the Same Question in 1989 as the Dependent Variable

Independent variables	b	OR	*P*
Income (8 equidistant steps)	0.11	1.11	.000
Sex (female; male ref cat)	0.28	1.32	.038
Single (married or cohabitant ref cat)	−0.48	0.62	.001
Education (< 9 y ref cat)			
10–12 y	0.37	1.44	.048
> 12 y	0.43	1.54	.019
Age (y) (continuous)	−0.04	0.96	.000
Place of residence (city ref cat)	−0.13	0.88	.267
Dental status (all teeth left ref cat)			
One or several teeth missing	0.01	1.01	.959
Removable denture(s)	−0.89	0.41	.000
Completely edentulous in one or both arches	−1.38	0.25	.000
Public dental care delivery system (private practice ref cat)	−0.11	0.90	.429
Importance of dental function (7 steps)	−0.06	0.94	.082
Importance of dental appearance (7 steps)	0.02	1.02	.617

Total: n = 1,691; OR = odds ratio; ref cat = reference category.
Correctly predicted cases: 69.5%, 9% improvement; model χ^2: 295.67, $P < .001$, 13 *df*; Nagelkerke R^2: 0.22.

those wearing removable partial dentures or edentulous in one or both arches. For this subgroup, the independent variables "dental care delivery system" and "education level" showed a significantly higher probability to desire implant treatment for those attending private practice and for those with medium education level.

The final logistic regression model was done with the responses to the question about desire for implant treatment from 1989 in contrast to the responses to the same question in 1999 (Table 5). Young age, urban living, and better dental status showed a higher probability for desire for implant treatment in 1989 than in 1999.

In 1999, there was a relatively high nonresponse for questions regarding implant desire (21%). In 1989, the largest internal nonresponse was seen for questions regarding importance of good dental appearance (14%) and income (11%). When comparing those who responded only in 1989 with those participating in both 1989 and 1999, the nonresponse analysis showed that there were some differences between the groups (Table 6). Subjects who responded on both occasions were younger, had a higher level of education, and reported better dental status, ie, fewer participants wore removable dentures than those who responded only in 1989. Also, women and those who were married or cohabitants had a higher degree of responding to both questionnaires.

Discussion

The findings in the present study show that older people in comparison with other age categories, those living in village or rural areas in comparison with those living in cities, and those with one or several teeth missing that were not replaced in comparison with those with all teeth remaining or replaced by fixed partial dentures had changed their mind regarding desire for implant treatment.

As stated in a previous study in this series of papers, there was an immense increase in interest for implant treatment from 1989 to 1999.[5] In 1999, almost all (95%) of the study population expressed desire for implant treatment, a strongly significant increase and the main finding in this series of studies.

The responses from the questionnaire in 1999 showed that the independent variables "income" and "dental status" had a significant impact on the probability to have a desire for implant treatment among the total study group.

Dental status had a significant impact on expressed desire at both study time periods. Somewhat surprising was that those with a higher "objective" need (those with removable dentures and those being edentulous in one or both arches) had a lower desire for implant treatment in contrast to others. It seems obvious from the results of the present study that edentulous patients with removable dentures do not necessarily translate that condition into a desire for implant treatment, which is in accordance with previous studies.[4,11] Participants missing one or more teeth not being replaced and those who were completely edentulous with or without removable denture(s) were, in this study, considered as having a possible treatment need, though it was not possible to distinguish between the absence of an anterior tooth or molar on the basis of the information from the questionnaires. If this distinction had been possible, the results could have been even more obvious, since participants missing an anterior tooth would probably desire a replacement more than someone missing a molar. However, the number of participants missing a single molar was most likely very small considering the relatively high age of the participants.

"Objective" need is less associated with dental care utilization than subjective need.[4] This is also in accordance with the observation that there usually are great differences between provider and patient assessments of quality of life, where patients usually regard their quality of life as better than providers do.[12] Those who need implant treatment the most, when assessed by dentists, do not desire implant treatment as much as those with all of their teeth remaining or with one or a few teeth missing. The presence of one's own teeth is a significant predictor for dental care utilization.[13] The rather small group of edentulous participants in this study had a lower increase in desire compared to the total panel. This could be the effect of several socioeconomic gate-keeping processes.[14] Many edentulous individuals have a low income, and it is likely that some individuals do not consider treatments they know they cannot afford, even if their oral health–related quality of life would most likely benefit significantly from the use of dental implants.[15] In such situations, the desire for treatment does not change from latent to manifest. Other reasons could include fear of dental treatment and worry about surgical treatments, but it could also be that people really are more satisfied with their prostheses than the profession would consider.[16]

Cost, together with dental status, is a well-known barrier in the gate-keeping behind utilization of dental care, especially for fixed prosthodontic services.[17–19] Individuals with low incomes have a lower level of utilization and spend less money on dental care compared with individuals with higher incomes.[20] This, although to a lesser extent, also holds in subsidized systems.[21] The National Dental Insurance System in Sweden was introduced in 1973 and has changed a number of times since. The relative cost for implant treatment within the Swedish subsidized dental health care system did not decrease during the 10-year study period; rather, it increased to some extent. Income did not change as an important gate-keeping factor between the two study groups.

It seems obvious that desire for implant treatment should decrease with increased age, but in 1999, there were no longer any significant differences in age. Older people changed their minds regarding desire for implant treatment even though older individuals are said to be more reluctant about innovation. One possible explanation to this change in the older cohort could be that implant treatment and its good results had become well known, especially among older people where edentulism is more common. Other possible explanations could be that information about implant treatment was addressed to edentulous patients through newspapers, manufacturers, and dentists. More dentists had also adopted the treatment option of dental implants and were more comfortable with this treatment procedure. Supply and information about implant treatment had thus increased. On the other hand, older people with removable dentures do not attend dental clinics as often as those with a better dental status and, thereby, do not have the same information as individuals with higher utilization of dental services. This could also partly explain why the small edentulous group in the present study had a lower probability to desire treatment compared to the total panel.

During the past couple of decades, there has been a clear trend to involve the patient in the prosthodontic treatment-planning process.[7] However, dentists may still play a dominant role in the information and decision-making process in implant dentistry.[22] Stronger practice beliefs in certain treatment options give a higher rate of specific prosthetic utilization.[23] Studies indicate that dentists' opinions and clinical judgments are of greater importance than research evidence in treatment planning and decision making.[24] Demand is not only dependent on a manifest need, but also on the information and availability of different treatment options.

Rural residence played a significant role in 1989 but not in 1999. The importance of place of residence has in many ways been leveled out with the growth of mass communication. There is scarce evidence for different ideals regarding appearance and oral health–related quality of life because of place of residence. Studies indicate that the rural population is retaining more teeth and, consequently, may need and seek dental services more often than previously when there were pronounced differences in dental status between different place-of-residence cohorts.[25]

It has been shown that care organization influences both utilization and cost of care, resulting in higher cost and more frequent utilization for those receiving private care.[26] There might be a supplier-induced demand, which means overconsumption of medical services, generated by the economic self-interest of physicians who exaggerate patient needs.[27] The results in the present study indicate, however, that the difference in the Swedish dental care delivery system between public dental health care and private practice did not influence the desire for implant treatment, except for in the subgroup with removable dentures. For this group, there was a significantly higher probability for those attending private practice dental clinics to have a desire for implant treatment compared to those attending public dental health clinics. There was also a significant difference regarding education for this same cohort with removable dentures. Those with medium (10 to 12 years) education had a significantly higher desire for implant treatment than those with low education.

Oral health–related quality of life includes freedom of pain, optimal oral function, and good dental appearance.[28,29] Dissatisfaction with appearance has been found to be a major reason for transformation of need into demand.[30] There were no significant changes in desire for these categories in the present study. In 1989, there was a significant association between importance of good dental appearance and desire for implant treatment. This association was no longer significant in 1999, possibly because the overwhelming majority of respondents expressed demand for implants, leaving little room for variation.

Considering nonresponse, there was a clear bias in the response pattern. Point estimates are thus not reliable and probably too low, with underrepresentation of unmarried, low-educated men with bad teeth. However, it is less probable that associations are biased, and, if so, they are probably underestimated. Thus, analysis of the nonrespondents in 1999 indicated that some of the independent variables could be underestimated. There was an 11% higher probability to respond to the questionnaire for every income group. A higher response rate to the questionnaire in 1999 would probably have increased the impact of income even more.

A strength of this study is the longitudinal design, together with the use of multivariate analysis. Each effect of the independent variables is assessed, keeping the other variables constant, thus linking the individual patient's outcome over time to the effect of an independent variable. In this study, focus was on attitudes and opinions regarding need and demand, which may have a positive effect on validity. The nonresponse rate should be less important when studying change in attitudes over time among the same individuals in a cohort at two different occasions. Changes in attitudes are principally intraindividual since the panel includes the same individuals at both occasions.

The results of the study are over 10 years old, and it may be questioned whether the results are therefore applicable today. To the authors' knowledge, there has not been any major change in attitude toward implant treatment since, nor has there been any considerable change in cost for the cohorts in this study. It seems as though the present study happened to occur during a period where there was a dramatic change in attitude toward implant treatment. At the time of the second questionnaire, a vast majority expressed that they would consider and prefer implant treatment. To the authors' knowledge, there has been little change in social priorities, meaning that a change back to less desire for implant treatment is unlikely. Moreover, the purpose of this study was to discuss the factors behind the major change in attitude toward implant treatment, and this has not altered recently.

Further studies are important to provide greater insight toward the influence of the number and location of missing teeth, as well as other factors such as psychologic factors, possibilities to maintain oral hygiene, and fear of complications.

Conclusion

Manifest need and desire for implant treatment most likely changes over time. Factors influencing desire for implant treatment are income and dental status. Age, place of residence, and concern for dental appearance no longer influenced desire for implant treatment at the end of the studied 10-year period. Individuals with removable dentures or those who were edentulous in one or both arches had a lower probability to desire implant treatment than those with all their teeth remaining or with missing teeth replaced by fixed partial dentures.

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