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ORIGINAL ARTICLE

Satisfaction with dental care and life-course predictors: A 20-year prospective study of a Swedish 1942 birth cohort?

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ABSTRACT

Objectives: The aim was to assess the impact of care experience, health factors and socioeconomic factors on satisfaction with dental care across time and to assess the stability or change in levels of self-reported satisfaction with dental care in individuals as they progress from middle age to early old age.

Materials and methods: The present work is based on five separate data collections from a cohort study with 3585 individuals responding in all years of the survey. Data collection was conducted in 1992 when the subjects were 50 years of age and again 5, 10, 15 and 20 years later. Absolute stability in satisfaction with dental care was assessed by calculating the proportion of individuals who maintained their position in the same category from one survey period to another. Changes across time were tested using Cochran's Q test. Satisfaction with dental care across the 20-year survey period was modeled using the generalized estimating equation (GEE).

Results and conclusion: The result showed that 85% of women and 83% of men remained satisfied with dental care. Binomial GEE revealed no statistical significant change in satisfaction with dental care between 1992–2012. In sum, this study has shown that this age group, born in 1942, was stably satisfied with dental care between age 50 and age 70, despite all changes during this time period. Females are more satisfied than men and the most important factors are the experience of attention during the last visit, satisfaction with dental appearance and good chewing capability.

Keywords: *Elderly*, *longitudinal*, *survey*

Introduction

Many population studies have investigated satisfaction with healthcare and dental care because of its multifaceted importance for service quality assurance, in-treatment evaluations and for health outcomes [1–6]. There is no generally accepted definition of "patient satisfaction", neither in healthcare nor in dental care. The complexity of this concept has earlier been discussed extensively [5–7]. Whenever searching on either Pub Med or Google scholar, the result shows that the majority of research in this area is about satisfaction with healthcare, while there is less research about satisfaction with dental care.

In 2002, Crow et al. [2] presented a systematic review of measurement of satisfaction with healthcare. They stated that the findings of the 58 studies that investigated the relationship between reported satisfaction and age confirmed the conventional wisdom: older respondents were, generally, significantly more satisfied than younger participants. International studies from different countries have shown a high percentage of adults >65 years of age rate hospital care as good or excellent (Australia = 94%, New Zealand = 95%, Canada = 92%, USA = 90% and UK = 94%) [8,9]. Because of their accumulated experiences different age cohorts will also have different valuations of the concept of satisfaction [10]. These types of effects over time can be discussed in various ways, but one common method is to differentiate between period, cohort and age effects. Period effects are those that

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affect the group while it is studied, while cohort effects are those that affect the group before the study period; age effect is directly related to differences in age of the group [10].

According to a life-course approach, exposure to factors at various life stages are likely to accumulate over the life span of an individual [11,12]. Yet, factors influencing satisfaction with dental care in subjects of middle and early old age are inadequately understood. Knowledge of the relative importance of factors at various life stages is important to developing public health strategies aimed at improving dental care of current and future cohorts of the elderly. Studies in the area of oral health have reported that oral health of the growing elderly population is inadequate and there is a global need and demand for more oral healthcare in this population [13,14]. There are limited studies that can differentiate whether this is a demand from patients or if it is induced from the professionals. In looking for answers to this question, longitudinal surveys of patients' satisfaction with dental care become important, reflecting the levels of demand from patients as they progress from middle-age to elderly.

As discussed earlier by Ekbäck et al. [15], longitudinal studies, in comparison to cross-sectional approaches, provide a clear picture of the direction and magnitude of change or of stability with advancing age over time. This study focuses on satisfaction with dental care and the longitudinal approach to identify factors associated with stability and change across time and to facilitate the identification of vulnerable population sub-groups in which undesirable changes are most marked. This approach makes it possible to infer causes and effects, which is not possible, even in repeated cross-sectional studies. Despite all the advantages with longitudinal studies, long-term epidemiological studies as well as analyses of time trends for prevalence of satisfaction with dental care are rare, especially among elderly people.

Guided by the conceptual model of Ståhlnacke et al. [5,6], the aim of this study was to assess the impact of dental care factors, care experience, general health factors and socioeconomic factors on satisfaction with dental care across time and to assess the stability or change of self-reported satisfaction with dental care in a panel of individuals as they progressed from middle age (50 years) to early old age (70 years).

Materials and methods

Population and response rate

This study started in 1992 when all 50-year-old individuals in Örebro and Östergötland counties in Sweden were invited to participate in a questionnaire. Of the total population of 8888 subjects, 6346 responded (response rate 71.4%). After that, the study continued and data collection was conducted again when the subjects were 55 years of age and every 5 years until they reached the age of 70 (Table I). The present work is based on the last cohort in Table I, which encompasses data from years 1992, 1997, 2002, 2007 and 2012.

Analysis of non-response

A non-response analysis was done for gender and county for the original group examined in 1992 and 1997 [16]. Analyses of differences between respondents and non-respondents have been presented in several of the previous papers in this series [16–20].

Questionnaire

The questionnaire comprised 53 questions with altogether 123 items and was originally described and discussed earlier [20]. The questions were divided into socio-economic conditions (e.g. age, gender, occupation), general health (e.g. physician visits, tobacco habits, drug consumption), and oral conditions (e.g. satisfaction with teeth, oral problems, oral hygiene habits, number of teeth). In this study, we used answers to questions referring to six factors in Ståhlnacke et al.'s [6] conceptual model. Ethical considerations in accordance with the Helsinki declaration have been observed throughout this series of studies. The ethical committees in

Table I. Number and percentages (%) of participants, categorized by age and gender, at each data-collection wave and total response rate based on participation at 50 years of age.

Survey year	Age	Women (%)	Men (%)	Total (response rate %)
1992	50	3184 (50.2)	3162 (49.8)	6346 (71.4)
1997	55	3330 (51.1)	3189 (48.9)	6519 (74.4)
2002	60	3289 (51.4)	3108 (48.6)	6397 (74.9)
2007	65	3080 (50.7)	2998 (49.3)	6078 (73.1)
2012	70	2896 (50.8)	2800 (49.2)	5696 (72.2)
Cohort by survey year	Cohorts by age			Total (response rate %) (% of response baseline)
92/1997	50/55	2753 (64.2)	2611 (51.3)	5364 (84.5)
92/97/02	50/60/65	2460 (58.2)	2276 (51.9)	4736 (74.6)
92/97/02/07	50/55/60/65	2164 (51.7)	1979 (52.2)	4143 (65.0)
92/97/02/07/12	50/55/60/65/70	1878 (52.4)	1707 (47.6)	3585 (56.5)

Uppsala, Sweden approved the study for the first time when it started in 1992 and finally in 2012 (dnr 2011-336).

Statistical methods

Data were analyzed using the Statistical Package for Social Sciences 22 (SPSS, Chicago, IL) on the intact cohort consisting of the subjects ($n = 3585$) participating in all waves at 50, 55, 60, 65 and 70 years of age. Stability and change in levels of satisfaction with dental care were described using cross-tabulations. Absolute stability in perceived oral health status was assessed by calculating the proportion of individuals who maintained their position in the same category from one survey period to another. Change in the proportions of subjects who were satisfied with dental care across time was tested using Cochran's Q test for several related samples. Satisfaction with dental care across the 20-year survey period was modeled using the generalized estimating equation (GEE) [21]. The GEE is a robust approach accounting for the dependency of observations between multiple measurements taken over time in the same individual [21]. The binomial logit function and independent correlation matrix were employed to estimate the likelihood of satisfaction with dental care across time and to present the results of those tests in terms of odds ratios (ORs) and 95% confidence intervals (CI). The model included both time-invariant and time-variant independent factors in terms of gender, dental care factors, recent care experiences, past care experiences, general health factors, oral health factors and, finally, socioeconomically factors. From the six boxes in the conceptual model (Figure 1) a number of independent factors from the first study 1992 were analyzed (Table II). Those factors with significant bivariate correlations with satisfaction with dental care were chosen for a further multiple regression analysis and those with significant correlation with satisfaction with dental care were put together in a final logistic regression, resulting in eight factors that remained significantly correlated. Those factors were put together in several generally estimated equation analyses and the regression with the lowest corrected Quasi Likelihood under Independence Model Criterion (QICC) was chosen. Pairwise interactions between the main independents were assessed and included if they met the significance criterion set at 0.05.

Results

Analysis of non-response

No significant differences were found between counties, but women tended to have significantly higher response rates than men in all years except 2012 ($p < 0.05$). The proportion of gender in drop-out participants during 1992, 1997, 2002, 2007 and 2012 collection wave differed only slightly. The non-response analysis of the response group in 2012 (5697) showed the following differences ($p < 0.05$) between the longitudinal group in the panel ($n = 3585$) and the cross-sectional group not in the panel ($n = 2112$): female, 52.4%/48.2%, good chewing capability, 96.2%/91.6%, and all or many teeth remaining, 74.8%/67.1%, respectively.

Longitudinal data

Table I shows the number and percentage of participants categorized by age and gender at each

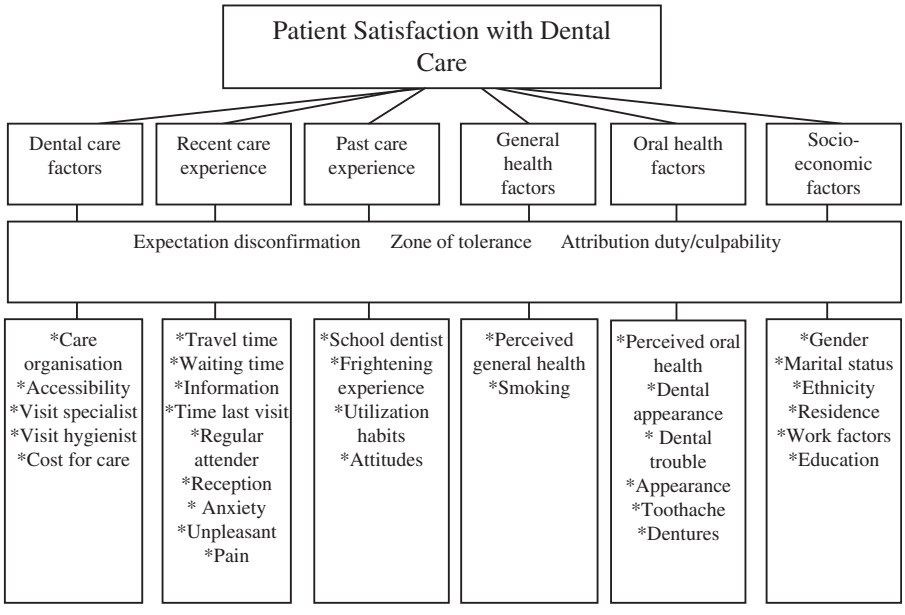

Figure 1. Conceptual framework in the analysis of patient satisfaction with dental care.

Table II. Categories for dependent and independent variables as recoded for analysis.

Dependent variable		
Satisfaction with dental care	1	satisfied (very satisfied, largely satisfied)
	2	dissatisfied (not especially satisfied, absolutely not satisfied)
Independent variables		
Dental care factors		
Care organization	1	private
	2	public
Visit the present dentist regularly	1	yes (twice or more yearly, once a year, every second year)
	2	no (less than every second year)
Patient cost for dental care	1	low (1–2 on a 4-grade scale)
	2	high (3–4 on a 4-grade scale)
Recent care experiences		
Travel time to dentist	1	< 60 min
	2	60 min or more
Waiting time in the practice	1	< 10 min
	2	10 min or more
Treatment time	1	< 60 min
	2	60 min or more
Experience of pain during the last visit (painless-unbearable pain)	1	1–2 on a five-grade scale
Experience of discomfort during the last visit	1	1–2 on a 5-grade scale
(no discomfort–very unpleasant)	2	3–5 on a 5-grade scale
Experience of anxiety during the last visit	1	1–2 on a 5-grade scale
(quite calm–very worried)	2	3–5 on a 5-grade scale
Experience of attention during the last visit (good–poor)	1	1–2 on a 5-grade scale
	2	3–5 on a 5-grade scale
Past care experience		
Frightening experience of dental care during childhood	1	yes (several times, one or two times)
or adolescence	2	no (no, don't remember)
Feeling it is important to have perfect teeth to	1	yes (absolutely, largely)
be well-treated by other people	2	no (not particularly, absolutely not)
General health factors		
Perceived general health	1	yes (absolutely, largely)
	2	no (not particularly, absolutely not)
Smoking	1	yes
	2	no
Oral health factors		
Chewing all kind of food	1	well (very well, rather well)
	2	poorly (less well, poorly)
Satisfaction with the appearance of teeth	1	satisfied (very satisfied, largely satisfied)
	2	Dissatisfied (not especially satisfied, absolutely not satisfied)
Number of own teeth	1	many (all teeth left, miss a few teeth)
	2	few (miss quite a lot of teeth, has nearly almost no teeth left, edentulous)
Many different sorts of discomfort from mouth and teeth	1	no
	2	yes
Full dentures in both jaws	1	no
	2	yes
Socioeconomic factors		
Gender	1	male
	2	female
Education	1	less than university
	2	university
Place of birth	1	Sweden
	2	other countries

survey year and also shows the total response rate based on participation at baseline at 50 years of age ($n = 6346$). Some factors from Table II, for instance, the importance of continuity of care, did not reach statistical significance, but were divided on gender; this variable showed a minor correlation for women. Table III shows that 85% of women and 83% of men between 50–70 years of age remained satisfied with dental care. Corresponding figures, with respect to dissatisfaction, were 0.1% and 0.4%, respectively. A total of 3% of women and 3% of men changed from being dissatisfied to being satisfied, whereas 2% of women and 3% of men changed status from being satisfied to being dissatisfied during that period.

Table IV shows the proportions of responders who were satisfied with dental care at each survey year in the cohort and lists them separately by gender and origin. Cochran's Q test revealed no statistical changes across time. Neither binomial GEE in Table V revealed any statistically significant changes in satisfaction with dental care between 1992–2012. Two-way interaction effects were statistically significant for chewing capability and number of teeth

Table III. Stability and changes in satisfaction with dental care (% of total sample) between the ages of 50 and 55, 55 and 60, 60 and 65, 65 and 70 and 50 and 70 years.

Age range	Total % ($n = 3585$)	Males % ($n = 1707$)	Females % ($n = 1878$)
50–55			
Stable satisfied	92% (3228)	91% (1529)	93% (1699)
Stable dissatisfied	2% (57)	2% (31)	1% (26)
From satisfied to dissatisfied	3% (100)	3% (55)	2% (45)
From dissatisfied to satisfied	3% (113)	3% (115)	3% (161)
55–60			
Stable satisfied	92% (3198)	91% (1518)	93% (1680)
Stable dissatisfied	2% (67)	2% (39)	2% (28)
From satisfied to dissatisfied	3% (101)	3% (48)	3% (53)
From dissatisfied to satisfied	3% (92)	3% (121)	3% (120)
60–65			
Stable satisfied	92% (3180)	92% (1509)	92% (1671)
Stable dissatisfied	2% (63)	2% (35)	2% (28)
From satisfied to dissatisfied	3% (98)	3% (45)	3% (53)
From dissatisfied to satisfied	3% (103)	3% (122)	3% (141)
65–70			
Stable satisfied	92% (3228)	91% (1524)	93% (1704)
Stable dissatisfied	1% (47)	2% (27)	1% (20)
From satisfied to dissatisfied	3% (109)	4% (63)	2% (46)
From dissatisfied to satisfied	3% (108)	3% (123)	3% (154)
50–70			
Stable satisfied	84% (2856)	83% (1349)	85% (1507)
Stable dissatisfied	0.2% (7)	0.4% (6)	0.1% (1)
From satisfied to dissatisfied	4% (126)	4% (73)	4% (53)
From dissatisfied to satisfied	4% (136)	4% (69)	4% (67)

Table IV. Percentage of subjects being satisfied with dental care at each age from 50–70.

	Total	Female subjects	Male subjects	Native subjects	Foreign subjects
1992	95.1	95.4	94.7	95.3*	91.1*
1997	95.4	95.9	94.8	95.5	93.5
2002	95.3	95.5	95.2	95.5*	91.6*
2007	95.1	95.6	94.6	95.3	92.0
2012	95.4	96.2*	94.5*	95.6*	90.9*

*Significant differences between groups the same year ($p < 0.05$).

($\chi^2 = 13.20$, $p < 0.001$). This result indicates that the effect of number of teeth on satisfaction with dental care varies as a function of the respondents' status with respect to chewing capability. When this analysis was divided according to gender, the model fit increased and some results changed. Low dental cost remained statistically significant only for women, while satisfaction with the appearance of teeth and good experience of attention from the practitioner during the last visit remained the most important variables (data not in Table).

Discussion

This study implies that the impact of dental care factors, care experience, health factors and socio-economic factors on satisfaction with dental care across time is mainly stable for this cohort from age 50 to age 70. This is an interesting and perhaps surprising finding due to the many major changes in Swedish dental care and the reimbursements from the National Dental Insurance agency during the same time. The long follow-up allowed the participants to experience all these changes and also the emotional and cognitive changes associated with the transition from an active, working lifestyle through retirement. During this period, satisfaction with oral health decreased for this age group [22], patients' costs for dental care increased [23] and the possibility of implants to improve chewing capability has increased [24]. However difficult it is to differentiate between age, period, and cohort effects, the results suggest that stability in satisfaction with dental care were subject to both age and cohort effects [10].

Older respondents are generally more satisfied with healthcare than younger participants [2], but this study showed an absence of differences in satisfaction over time between patients among caregivers, contrary to some earlier reports [6]. Perhaps a much higher cost for patients among all caregivers could be a contradicting variable for higher satisfaction with dental care during this time [25].

In an earlier review of patient satisfaction, Newsome and Wright [7] discussed gender, economic status, previous dental experience, regular versus irregular attenders and dental anxiety related to satisfaction with dental care. This study has also addressed these factors and found women tended to be more satisfied with dental care than men, contrary to some earlier studies [4,26], but in line with others [27]. Other studies have found that women's overall satisfaction with visits is more dependent than men's on informational content, continuity of care and a multidisciplinary approach, whereas men's overall satisfaction is more dependent on the personal interest shown to them by providers [28]. In this

Table V. Satisfaction with dental care over time regressed on different waves (1992, 1997, 2002, 2007 and 2012) and on dental care factors, care experiences, health factors, and socioeconomic factors.

Factors	*p* value	OR	95% CI	
Year/age 1992/50	0.522	0.9	0.7	1.2
Year/age 1997/55	0.487	0.9	0.6	1.1
Year/age 2002/55	0.468	0.9	0.7	1.1
Year/age 2007/60	0.671	1.0	0.8	1.3
Year/age 2012/65 (ref)				
Gender (male)	<0.001	0.7	0.6	0.9
Experience of anxiety during the last visit (quite calm)	0.018	1.4	1.1	1.7
Experience of attention during the last visit (good)	<0.001	2.9	2.1	4.1
Chewing all kind of food (with small problem or no problem)	0.002	1.7	1.2	2.5
Satisfaction with the appearance of teeth (satisfied)	<0.001	2.8	2.2	3.4
Number of own teeth (all teeth or many)	0.654	0.9	0.4	1.7
Different sorts of discomfort from mouth and teeth (no problems or small problems)	<0.001	1.5	1.2	1.9
Chewing capability*number of teeth (good chewing capability* all teeth or many)	<0.001	3.6	1.8	7.1

Model fit QICC, corrected Quasi Likelihood under Independence Model Criterion = 4588.515.

study, the experience of attention during the previous visit was similarly high for both men and women.

Economic status and anxiety is generally important variables in studies of oral health and satisfaction with dental care. Earlier studies have shown people from low income groups and people experiencing anxiety have negative perceptions of care but are similarly influenced by factors associated with satisfaction with dental care [29–31]. Separate gender analyses also showed that economy was important only to women, perhaps reflecting that men in general are more economically independent.

Researchers also generally hold there is a positive correlation between the degree of use of dental care services and satisfaction with care, even if some studies have not found such differences [32,33]. In this study, this factor disappeared in the final analysis when taking into account the repeated measurements and the longitudinal approach, indicating this factor was less important during the 20-year study period for this study group.

Earlier findings indicate that adolescents have a strong association between painful experiences and satisfaction with dental care [4]. In this age cohort, painful experiences did not have any significant effect on satisfaction with dental care in the final analysis, but some small correlation was seen in the unadjusted analysis. Many of these patients have had a very long and stable contact with their dentist, and earlier studies have shown that dentists who had consistently performed well in the past could weather an occasional poor performance because patients attributed any shortcoming to uncontrollable elements [34]. Frightening experiences of dental care during childhood or adolescence did not reach statistical significance in the final analysis and were probably acting as contributing factors to anxiety.

Foreign-born subjects were less satisfied with dental care than native-born subjects. The difference reached statistical significance in 1991, 2002, and 2012. One explanation could be found in earlier studies that describe how references and expectations influencing a subject's oral health ratings might differ across socially and culturally diverse population groups [35].

The two-way interaction effect indicates that the effect of number of teeth on satisfaction with dental care varies as a function of the respondent's status with respect to chewing capability. Without entering this interactions in the model, the number of teeth (many or all) have a significant positive correlation with satisfaction with dental care (OR = 2.83, $p < 0.001$). Neither education nor country of birth, reflecting early social position, reached significant correlation in the final regression, but country of birth varied systematically with satisfaction with dental care in an unadjusted analysis. Nevertheless, these early factors may have acted primarily by contributing to tooth status in middle-age and early-old adult life [36].

This is a large population study addressing and challenging a globally growing age group. The responders' answers were followed on an individual basis from 1992–2012 and the response rate is high for a 20-year longitudinal group study. Several non-response analyses have also been done for the study. Finally, the study draws strength from using a conceptual model and from taking into account correlated responses within individuals. Despite all strengths of this study, the results may be interpreted with some caution. All conceptual models simplify reality and there can be other important factors, which are not accounted for in this study. Another important problem with all longitudinal studies is attrition, leading to missing data. This occurs as people move out of the study population or die, but attrition due to deaths have been found to be of minor concern in studies of older people [37]. Another problem mentioned in the literature is an unreliable census, i.e. one that has not been updated [38,39]. The demographics in Sweden are well documented; the statistical database is considered accurate and is updated weekly. Values and attitudes change over time and the rate of change in society

combined with the changes occurring among the original responders in a panel makes questionnaires difficult to compare over time. Investigators who report such results must take this into consideration. That means that a 50-year-old in 1992 cannot automatically be assumed to have the same attitudes or values as when he or she is 70 years old.

Comparing the cohort participating each year with the final cohort in 2012, we noted an over-representation of females who had good oral health status like good chewing capability and many remaining teeth. These biases were partially handled by controlling for gender, chewing capability and number of teeth in the final analysis, but the presence of non-response bias cannot be ruled out completely.

In sum, this study has shown that this age group, born in 1942, is stably satisfied with dental care from the age 50 until age 70, despite all changes during this time period. Females are more satisfied than men and the most important positive factors are the experience of attention from the practitioner during the previous visit, satisfaction with dental appearance, and good chewing capability. Country of origin seems to have an important effect on satisfaction with dental care; the least satisfied group is foreign-born subjects. In contrast to their native counterparts, they did not give unchanging responses through each of the surveys, but varied them from period to period. It is probable that present findings are representative for this age cohort in Sweden and can be relevant to Swedish policymakers.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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