

The dentist-patient relationship and oral health-related quality of life among older adults - a cohort study

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Background: Information about the quality of the dentist-patient relationship is important for dental care provision and healthy ageing.

Objectives: To assess the association between aspects of the dentist-patient relationship at age 65 and Oral Impacts on Daily Performances (OIDP) at ages 65 and 70, and to examine whether dental avoidance behaviors play a role in explaining that association.

Method: Secondary data analysis of a cohort study of Norwegians born in 1942. The participation rate in 2007 (age 65) and 2012 (age 70) was, respectively, 58.0% (n=4211) and 54.5% (n=3733). A total of 70.0% (n= 2947) of the baseline participants responded in 2012. Dentist-patient relationship aspects were assessed in terms of communication with the dentist, satisfaction with dental care, unpleasant experiences and changes of dentist. Generalized Estimating Equations (GEE) were used to account for repeated measurements. **Results:** Prevalence of oral impacts (OIDP) was 29.0% in 2007 and 28.4% in 2012. Participants who received communication on oral hygiene during dental visits had a higher likelihood, whereas participants who reported satisfaction with dental care, no unpleasant experience and did not change dentist had a lower likelihood of reporting oral impacts over these 5 years. Corresponding odds ratios were: 1.2 (95% CI 1.0-1.5), 0.4 (95% CI 0.3-0.5), 0.6 (95% CI 0.5-0.7), and 0.5 (95% CI 0.3-0.6). Associations between dentist-patient relationship aspects and OIDP remained unchanged after adjustment for avoidance behaviors.

Conclusion: Training dentists in relationship skills might improve social interaction with patients and the oral health-related quality of life of older people in Norway.

Key words: dentist-patient relationship, oral health related quality of life, dental attendance,

1 BACKGROUND

The number of Norwegian adults who are ≥ 67 years is expected to increase from 0.8 million in 2020 to 1.6 million by 2060.¹ During recent decades, the percentage of adult people with tooth loss has dropped in many industrialized countries, including Norway.²⁻⁴ However, oral diseases tend to accumulate with age alongside lower income due to exit from the labor force, loss of social networks and decline in functional and cognitive capacity.^{5,6} Oral conditions are associated with worse oral health-related quality of life (OHRQoL) and this might play an important role in the daily lives of ageing adults.⁷ Many generic and condition specific OHRQoL measurement tools are available, with the Oral Health Impact Profile (OHIP), Oral Impacts on Daily performances (OIDP), and Geriatric Oral Health Index (GOHAI), identified as psychometrically appropriate and the most widely used instruments in adult populations.⁸

OHRQoL has been associated, not only with clinical measures of oral diseases, but also with socio-behavioral and psychological factors across age groups within and between populations.⁸⁻¹² In Norway, a nation-wide population-based study of adults aged 25-35 years revealed that oral impacts were associated with age and unpleasant dental care experiences.¹³ Similar findings were reported from a 25-year follow-up- study of Swedish older people.¹⁴ Cohort studies of older adults in Norway and Sweden, as well as of Norwegian adolescents, have identified strong associations of OHRQoL with early- and later life course socio-behavioral characteristics.^{15,16} However, whereas clinical-, social-, psychological- and behavioral factors have been identified as important covariates of OHRQoL, less is known about the covariates of interpersonal concerns, such as aspects of the dentist-patient relationship.¹⁷

As a consequence of living longer and retaining more natural teeth, many of which are heavily restored, treatment decisions for older people become more complex and their need for quality oral health care services increasingly prominent.¹⁸ A favorable dentist-patient relationship remains a key aspect of dental health care encounter, particularly for older people, and it is likely to contribute to higher quality dental care.¹⁹ Aspects of the dentist-patient relationship might include (but are not limited to) trust in dental care providers, regular dental attendance, dental fear, satisfaction with dental care, therapeutic communication during dental encounters, and involvement in making treatment decisions.¹⁹⁻²¹ Studies on dentist-patient relationship aspects and their associations with oral health in older populations have shown that satisfaction with dental care, lack of dental fear, and trust in dental service providers have been positively associated with good OHRQoL.¹⁷⁻²³ Older people do not maintain regular contact with their dentists, for various reasons, and US individuals with low trust in dental care providers were less likely to have a regular dentist.^{19,24}

A favorable dentist-patient relationship might be beneficial for healthy ageing by promoting regular dental care and good oral health in older patients. Most previous studies investigating associations between dentist-patient relationship aspects and oral health have been cross-sectional and included only a few aspects.^{7,17,19,21,23,25} Longitudinal studies exploring and explaining the temporal association between various aspects of dentist-patient relationship and oral health outcomes in the context of cost barriers to dental care, are rare.

This study focuses on a cohort of older Norwegian adults, suggesting that aspects related to dentist-patient relationship at age 65 are associated with subsequent oral impacts on daily performances, i.e. with worse OHRQoL. It is further anticipated that avoidance of dental care due to cost is associated with negative aspects of dentist-patient relationship and with worse

OHRQoL and thus might partly explain the association between dentist-patient relationship and OHRQoL across time. Specifically, this study aimed to (1) assess the unadjusted and adjusted association between dentist-patient relationship aspects at age 65 and oral impacts on daily performances at ages 65 and 70, (2) examine whether dental avoidance due to cost plays a role in explaining the temporal association between dentist-patient relationship aspects and subsequent OHRQoL.

2. MATERIALS AND METHODS

2.1 Sample

The present work is based on two separate data sets from a prospective cohort study of older Norwegian adults born in 1942. Participants were residing in three Norwegian counties chosen to represent urban and rural areas and variation in oral conditions. Information was collected on a wide range of oral health and related concepts by means of self-administered questionnaires containing core questions that were repeated at each survey year. Data were collected in 2007 when participants were aged 65 years and again after 5 years in 2012 at the age of 70 years. The study populations were defined by continuously updated versions of the 1942 cohort at each survey occasion. The final participation rate in 2007 and 2012 was respectively, 58.0% (4211) and 54.5% (n=3733). A total of 70.0% (n= 2947) of the participants at baseline responded to the survey in 2012. Ethical considerations were in accordance with the principles of the Declaration of Helsinki and were approved by the Ethics Committee of the Norwegian Social Science s (NSD) services and Regional Committee for Medical and health research ethics (REK). Written informed consents were obtained from the participants both in 2007 and 2012. A detailed description of the methods including recruitment process, number of participants included in both surveys and results using inverse

probability weighting to adjust for missing responses and loss to follow-up have been described in a previous study (15).

2.2 Measures

The outcome variable was the Oral Impacts on Daily Performances, OIDP, assessed repeatedly as a time-variant variable in 2007 and 2012.^{26,27} Previous research has demonstrated acceptable psychometric properties of the OIDP inventory in the Norwegian non-institutionalized population of older adults with respect to validity, reliability and responsiveness across time.^{27,28} At each survey, participants replied to the following 8 questions *'During the last 6 months, have problems with your teeth and mouth caused you any problem with the following daily activities; eating, speaking clearly, cleaning teeth, smiling and showing teeth without embarrassment, emotional stability, enjoying social contact, performing daily work'*. Each item was recorded on Likert scales ranging from (1) affected daily or almost every day to (5) never effected. Each item was dichotomized into (0) not affected and (1) affected at least monthly (including the original categories 1-4). A summary score (0-8) was dichotomized into (0) no impacts and (1) at least one oral impact. The prevalence of oral impacts (OIDP>0) was estimated for every wave and treated as a repeated outcome measure in multivariable analyses.

The main exposure variables were aspects of the dentist-patient relationship assessed in 2007. Participants were asked about different aspects of dentist-patient relationship as follows: 1) having communicated with a dental provider during the last dental visit regarding: a) cost of treatment, and b) oral hygiene (1= yes, 0 = no); 2) being satisfied with dental care (1= very satisfied, 2 = satisfied, 3 = dissatisfied, 4 = very dissatisfied); 3) having wished to change the current dentist during the last 5 years (1= several times, 2= sometimes, 3= No, I do not remember); 4) having had unpleasant dental care experience in the past (1= Several times, 2=

sometimes, 3= no, 4= I do not remember). Having communicated with a dental provider was recoded into 0= negative relationship (including the original category 0) and 1= positive relationship (including the original category 1). Satisfaction with dental care was recoded into 0= negative relationship (including the original categories 3,4) and 1=positive relationship (including the original categories 1,2). Having wished to change the current dentist during the last 5 years was recoded into 0= negative relationship (including the original categories 1,2) and 1= positive relationship (including the original category 3). Having had an unpleasant dental care experience in the past was recoded into 0= negative relationship (including the original categories 1,2) and 1= positive relationship (including the original categories 3,4).

Several socio-behavioral variables assessed at baseline were included as covariates in the analyses: sex (male, female), education (higher, lower), dental attendance frequency (twice or several times a year, once a year, every second year, more seldom) dichotomized into (1) dental attendance annually and (2) dental attendance less than annually, cost of treatment in the last year (1= nothing, 2= 1-1000 NOK, 3= 1001-2000 NOK, 4= 2001- 8000 NOK, 5= More than 8000, 6= I do not remember). Cost of treatment was dichotomized into 0= low treatment cost (including the original categories 1, 2) and 1= high treatment cost (including the original categories 3-5).

Avoidance of dental visits due to cost and avoidance of proposed treatment due to cost were used as potential mediators in the temporal association between dentist-patient relationship and OIDP. Participants were asked 'Have you avoided dental visits due to cost/avoided proposed dental treatments due to cost during the last year?' Each variable was recorded as yes (1) or no (0). Additive sum scores of measures over the 2007-2012 period were computed ranging from 0-2 and dichotomized into 0= no avoidance of visits/avoidance of proposed treatments due to cost in 2007 and 2012 and 1= avoidance of visit/avoidance of proposed treatment due to cost at least once (i.e. either in 2007 or 2012, or in both years).

2.3 Statistical analyses

All analyses were conducted using IBM SPSS version 28.01 (SPSS Inc, Chicago, IL, USA) Unadjusted bivariate analyses used cross-tabulations and Chi-squared statistics. The prevalence of oral impacts across time was assessed using Cochran's Q for repeated measures. Unadjusted and adjusted Generalized Estimating Equations (GEE) with robust variance estimates to account for cluster effect in repeated outcome measures were performed to estimate associations between exposures, mediators and covariates and OIDP across time in 2007/2012. The binomial GEE models included time invariant exposures, time invariant covariates assessed at baseline and the combined 2007/2012 variables for avoidance of dental visits and avoidance of proposed dental treatment. Series of adjusted multivariate binomial GEE models were fitted and built by adding variables into the equation in the following order: Model 1: unadjusted associations between dentist-patient relationship aspects and OIDP; Model II: associations adjusted for socio-demographics; Model III: associations additionally adjusted for the combined 2007/2012 dental avoidance behaviors. The models of best fit were assessed in terms of the corrected quasi-likelihood under independence model criterion, QICC. Pairwise interactions between survey year and each aspect of the dentist-patient relationship with oral impact prevalence were also examined in this final model. Any mediation of the dentist-patient relationship-OIDP association through dental avoidance behaviors was evaluated by the conventional method suggested by Baron and Kenny.²⁹

3 RESULTS

Data from 2,947 older adults that participated both at baseline (in 2007 at age 65 years) and follow-up (in 2012 at age 70 years) were analyzed in this study. Analyses of non-participation in the cohort showed statistically significant differences between the groups who were and were not followed-up with respect to tooth loss (more prevalent among non-responders),

smoking status (more prevalent among non-responders), and education (lower education more prevalent among non-responders). Overall, 74.3% of non-respondents and 67.5% of respondents reported having low education in 2007.

The prevalence of avoiding dental visits due to cost was 9.7 % and 8.6% in 2007 and 2012, respectively, while corresponding figures for avoiding proposed dental treatments due to cost were 8.3% and 9.1%. As depicted in Table 1, the prevalence of less favorable aspects of the dentist-patient relationship at baseline ranged from 9.8% (want to change current dentist) to 67.5% (not received communication during dental visits). The prevalence of avoidance of dental visits and proposed treatments in 2007 and 2012 was lower among females (than males), among the higher educated (than lower educated) participants, among those reporting low (than high) treatment costs and in those reporting dental care annually (than less than annually). All five aspects of the dentist-patient relationship differed significantly between participants who avoided dental visits/proposed treatments and those who did not in 2007 and 2012. In 2007, the prevalence of avoiding dental visits was higher among participants who confirmed having received communication about oral hygiene status than among those who did not (13.0% versus 7.3%, $p<0.001$), higher among participants dissatisfied versus satisfied with dental care (23.1% versus 7.9%, $p<0.001$), and higher among those with unpleasant dental care experiences in the past compared with those without such experience (12% versus 7.2%, $p<0.001$).

The prevalence of oral impacts (OIDP>0) was 29% in 2007 and 28.4% in 2012. Table 2 depicts the prevalence of OIDP in 2012 according to baseline aspects of the dentist-patient relationship, covariates and dental avoidance behaviors 2007/2012. As shown, the prevalence of oral impacts differed between participants with low (25%) and high treatment cost (34.5%), and those who confirmed dental care annually (25.6%) and less than annually (43.8%). The prevalence of oral impacts was consistently higher among those presenting with less favorable

aspects of dentist-patient relationship in terms of dissatisfaction with dental care, having unpleasant dental care experience and having a wish to change the current dentist as well as among those who confirmed avoidance of proposed treatment at least once during 2007 and 2012.

Table 3 depicts unadjusted and adjusted ORs estimates for OIDP across time (2007/2012) by baseline aspects of the dentist-patient relationship adjusted for baseline socio-demographics and dental avoidance behavior across 2007 and 2012. Survey year and education were not significantly associated with OIDP across time in unadjusted GEE analysis (Model I) but were forced into the multivariable models. As shown in Model II, after adjustment for socio-demographic characteristics, participants who had received information about the cost and oral hygiene during the last dental visit had a higher likelihood of reporting oral impacts over time. The corresponding ORs and 95% CI were respectively 1.2 (95% CI 1.0-1.4) and 1.3 (95% CI 1.0-1.5). Participants reporting satisfaction with dental care, no unpleasant experience with dental care and those who did not want to change dentist had a lower likelihood of having oral impacts across time. The corresponding ORs were 0.4 (95% CI 0.3-0.5), 0.6 (95% CI 0.5-0.7) and 0.4 (95% CI 0.3-0.6). Adding avoidance of dental visits and avoidance of proposed dental treatment in Model III revealed strong associations with OIDP across time. Participants who avoided the proposed dental treatment at least once and those who avoided a dental visit at least once during the period 2007-2012 were respectively, 2.0 (95% CI 1.5-2.7) and 1.9 (95% CI 1.4-2.6) times more likely to report oral impacts than those who did not avoid the proposed dental treatment and those that did not avoid a dental visit. All aspects of the dentist-patient relationship, except communication about treatment cost during the last dental visit, maintained their significant association with OIDP in the final Model (III). No two-way interactions between survey year and each aspect of the dentist-

patient relationship was statistically significant indicating that the associations between aspects of the dentist-patient relationship and OIDP did not change over time.

4 DISCUSSION

To our knowledge this is the first longitudinal study addressing the associations of several aspects of the dentist-patient relationship with older people's oral health in the context of dental avoidance behaviors due to cost. It revealed that various less favorable aspects of the dentist-patient relationship were associated equally strongly over time with impaired OHRQoL. This finding adds to the evidence from previous cross-sectional studies from Australia^{19,21,22} and UK¹⁷ and it supports the theoretical framework of Wilson and Cleary²⁰, where dentist-patient relationship aspects are conceived of as social and psychological predictors of oral health and quality of life. Although avoidance of dental visits and avoidance of proposed dental treatment due to cost were associated with less favorable dentist-patient relationship and higher prevalence of oral impacts, these avoidance behaviors explained very little of the temporal association between the dentist-patient relationship and OIDP. Thus, the assumption that dental avoidance behavior due to cost mediates the association of negative dentist-patient relationship with subsequent oral health was not supported. Nevertheless, dental avoidance behaviors turned out to be relatively strong covariates of oral impacts in the final adjusted GEE model. Participants who had avoided the proposed treatment and dental visits due to cost were about twice as likely as their counterparts to report oral impacts on daily performances across time. This accords with findings of a previous Norwegian study as well as with a Swedish cohort study^{13,14} and with research suggesting that deteriorated oral health related quality of life associated with higher levels of unmet need for health and oral health care.^{17,30}

A strength of this study is its longitudinal design, the substantial number of participants from the general population followed-up over 5 years, and the use of advanced and appropriate statistical analysis (GEE model), accounting for the cluster effect of repeated outcome measures. Considering the adjustment for baseline oral impacts and the fact that aspects of the dentist-patient relationship were measured at baseline, 5 years ahead of the follow-up OIDP measure, the findings indicate a stable and strong association between a less favorable dentist-patient relationship and poor oral health related quality of life in older Norwegian people. The longitudinal design also limits the potential bias of the ‘common method variance’, referring to the amount of spurious covariance shared among the variables due to the self-reported method used to collect both exposure and outcome variables.³¹ This study assessed prospectively various dentist-patient relationship aspects using five single items and included a potential intermediate outcome in terms of dental avoidance behaviors due to cost. Evidently, factors from patients’ experience about the relationship with their dentist have been reported in the literature^{17,32}, but they have not been sufficiently studied in terms of their association with oral health outcomes. The few decisive attributes commonly suggested to reflect dentist-patient relationship, namely patients trust in clinicians, satisfaction with care, dental fear, communication and involvement in decision making seem to be fairly well covered by the five variables measured in the present study.³³

This study had also some limitations that should be considered. Causal inference analyses were not performed and any causal effects between the dentist-patient relationship and OHRQoL cannot be identified. Nevertheless, identification of strong covariates might indicate a causal relationship that has to be verified in future analyses. Mediation analysis was performed by the traditional change-in-estimate regression method of Baron and Kenny.²⁹ Recently, studies have started to assess how behaviors account for the relationship between socio-psychological factors and oral health outcomes using different statistical methods such

as structural equation modelling and counterfactual models.^{34,35} Moreover, all variables utilized were self-reported and assessed retrospectively and thus might incorporate measurement errors in terms of social desirability and recall bias and differential misclassification of the exposure. Avoidance behavior was strictly limited to avoidance of dental visits and proposed treatments due to cost. Thus, other aspects of avoidance behavior such as for instance avoidance due to dental fear and avoidance due to acceptability, accessibility and lack of awareness were not analyzed in the present study. In addition, unmeasured confounding variables might have biased the present findings. Possible selection bias, compounded through considerable sample attrition and non-response, cannot be ruled out; however, data were weighted using inverse probability weighting to account for non-response and loss to follow-up.

Most of the aspects of dentist-patient relationship associated strongly and in the expected direction with oral impacts over time after adjustment for potential confounding factors and avoidance behaviors due to cost. A meta-analytical review revealed that dentist-patient relationship aspects were strongly associated with subjective health outcomes and these associations were stronger than those with clinical measures of health.^{17,36} A study among dental patients with occlusal splints showed that the more satisfied the patients were with the dental provider, the better their oral health related quality of life.³⁷ Muirhead et al¹⁷ found lack of trust and confidence in dental providers to be strongly associated with poor oral health related quality of life among older people in the UK. Recently, Song et al²² identified two salient constructs of the dentist-patient relationship, satisfaction with dental care and trust in dentists, as uni-dimensionally different but highly correlated constructs. Trust was not measured directly in this study since a validated trust scale was not available.²¹ However, aspects related to trust, such as wanting to change their current dentist, dissatisfaction with dental care and unpleasant experience with dental care were included.²¹ Dissatisfaction with

dental care, which might be attributed to perceived poor quality care, is recognized as a major reason for wanting to change dental provider.¹⁷ Dental fear and lack of trust following an unpleasant experience with dental care may act as a barrier towards accessing dental care and lead to poor oral health outcomes.^{17,22} Among our older adult cohort, avoidance behaviors due to cost were most frequently reported by participants who confirmed unpleasant experiences with dental care.

It is recognized that good dental provider communication is important for a 'patient-centered care style' in terms of patients' being involved in treatment decisions.³⁸ Interestingly, and at odds with our expectation, our findings revealed that patients who reported communication with their dental provider about treatment cost and oral hygiene were more likely to also report avoidance behaviors due to cost and oral impacts than their counterparts who did not report such communication. One explanation could be that communication about oral hygiene and treatment cost is more prevalent in patients with more extensive disease burden and complex treatment needs. This interpretation is further supported by the finding that patients having higher treatment costs were those most likely to report oral impacts on daily performances across time.

Contextual factors, such as the funding and organization of dental care services, might influence the association between the dentist-patient relationship and oral health in older people. Although there is a debate as to whether dental care for Norwegian adults should be subsidized by the State, dental care is currently provided on a fee for services basis and organized as a free market (with a few exceptions).³⁹ In this context, issues considering supplier-induced demand and people's perceptions of unethical conduct might negatively influence dentist-patient relationship aspects as well as dental visiting patterns.⁴⁰ Nevertheless, this study revealed that the prevalence rates of avoidance behaviors due to cost were modest, at about 10%, but higher among participants reporting larger treatment costs. The modest

prevalence of avoidance behaviors is in line with a high prevalence rate of regular dental attendees in the general adult Norwegian population.⁴¹ In accordance with a previous study, the prevalence rates of less favorable dentist-patient relationship aspects included in this study were also relatively low, except for communication and unpleasant experience with dental care.²¹

CONCLUSION

Less favorable aspects of the dentist-patient relationship seem to be associated with poor oral health related quality of life over a 5-year-period among Norwegian older adults. This association could not be explained by avoidance of dental visits and proposed treatments due to cost. Training dentists in relationship skills might facilitate better interaction with their patients and improve the oral health related quality of life of older people in Norway.

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CONFLICT OF INTEREST

There is no conflict of interest

AUTHOR CONTRIBUTIONS

ANÅ: had the idea of this study, wrote the manuscript and conducted statistical analyses. EN and FÖ contributed to statistical analysis and data management. GT has contributed substantially both intellectually to the development of the manuscript as well as to the analyses of data.

DATA AVAILABILITY STATEMENT

Data upon which this study is based is available from the authors upon request

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Table 1 Percentage of participants confirming avoidance from dental visits and proposed treatment due to cost in 2007 and 2012 by socio-behavioral covariates and dentist-patient relationship (DPR) factors in 2007

	Total	Avoiding dental visit 2007	Avoiding dental visit 2012	Avoiding proposed treatment 2007	Avoiding proposed treatment 2012
Baseline (2007)	% (n)	% (n)	% (n)	% (n)	% (n)
Socio-behavioral factors					
Sex					
Male	51.2 (1486)	10.4 (153)	9.2 (136)	7.8 (113)	9.9 (146)
Female	48.8 (1415)	8.8 (122)	8.0 (111)	8.4 (117)	8.2 (1149)
Education					
Lower	47.9 (1332)	13.4 (175)**	11.6 (151)**	10.4 (135)**	12.0 (156)**
Higher	42.1 (1450)	5.9 (85)	5.4 (78)	5.9 (85)	6.4 (92)
Treatment cost					
Low t	68.7 (1919)	7.4 (141)**	7.0 (133)**	5.7 (108)**	7.0 (132)**
High	31.3 (876)	12.3 (107)	10.6 (92)	12.6 (110)	12.4 (107)
Dental care					
Annually	85.5 (2448)	6.8 (167)**	6.2 (150)**	7.0 (168)**	7.7 (188)**
> Annually	14.5 (415)	26.1 (106)	22.4 (90)	14.9 (60)	17.1 (67)
Dentist-patient relationship					
Info cost of treatment					
Yes	35.0 (912)	14.5 (130)**	11.8 (107)**	12.4 (11)**	12.8 (115)**
--No	65.0 (1690)	7.1 (119)	6.7 (113)	6.0 (1001)	7.4(124)
Info hygiene					
Yes	32.5 (866)	13.0 (111)**	10.8 (92)	9.7 (83)	10.3 (88)
No	67.5 (1796)	7.3 (130)	7.1 (127)	6.8 (121)	1.2 (145)
Satisfaction care					
Dissatisfied	10.3 (294)	23.1 (67)**	17.1 (49)**	17.8 (52)**	19.1 (54)**
Satisfied	89.7 (2560)	7.9 (201)	7.6 (193)	7.0 (178)	7.9 (201)
Unpleasant experience					
Yes	50.5 (1453)	12.0 (171)**	10.9 (156)**	10.5 (150)*	11.4 (163)**
No	49.5 (1427)	7.2 (101)	6.3 (89)	5.9 (82)	6.9 (97)
Want to change dentist					
Yes	9.8 (280)	19.9 (55)**	15.1 (42)**	20.0 (55)**	17.7 (49)**
No	90.2 (2589)	8.4 (214)	7.7 (198)	6.0 (176)	8.1 (207)

**p<0.001, * p<0.05

Table 2 Percentage of participants confirming oral impacts in 2012 (OIDP>0) and mean (sd) OIDP by baseline sociodemographic, baseline dentist patient relationship (DPR) factors and avoiding dental visits at least once 2007/2012 and avoiding proposed treatment at least once 2007/2012

	OIDP prevalence (>0) % (n)	OIDP extent (0-8) Mean (sd)
<i>Socio-demographic covariates (2007)</i>		
Sex		
Male	31.5 (450)	0.8 (1.8)*
Female	25.2 (335)	0.7 (1.6)
Education		
Lower	29.9 (374)	0.8 (1.8)*
Higher	27.1 (378)	0.7 (1.6)
Treatment cost		
Low	25.0 (459)**	0.7 (1.6)**
High	34.5 (286)	0.9 (1.8)
Dental care		
Annually	25.6 (600)*	0.6 (1.5)**
> Annually	43.8 (168)	1.5 (2.4)
<i>Dentist-patient relationship (2007)</i>		
Info cost of treatment		
Yes	32.6 (283)**	0.9 (1.7)**
No	26.1 (425)	0.7 (1.6)
Info hygiene		
Yes	33.4 (273)*	0.7 (1.6)*
No	26.1 (450)	0.9 (1.8)
Satisfaction care		
Dissatisfied	53.1 (145)**	1.9 (2.5)**
Satisfied	25.4 (621)	0.6 (1.5)
Unpleasant experience		
Yes	34.1 (471)**	0.9 (1.8)**
No	22.8 (310)	0.5 (1.4)
Want to change dentist		
Yes	44.1 (116)**	1.5 (2.2)**
No	26.6 (658)	0.7 (1.6)
<i>Avoidance behavior (2007/2012)</i>		
Avoid dental visit		
Yes	55.1 (189)**	2.1 (2.6)**
No	24.3 (572)	0.6 (1.4)
Avoid proposed treatment		
Yes	56.5 (190)**	2.0 (2.6)**
No	24.4 (582)	0.6 (1.4)

**p<0.001, *p<0.05

Table 3. OIDP across time (2007/2012) regressed on DPR aspects (2007), adjusted for socio-demographics (2007) and avoidance behavior 2007/2012. Unadjusted (model 0) adjusted for socio-demographics (model 1), adjusted for socio-demographics and avoidance behavior (Model II)

	OIDP>0 Unadjusted	OIDP>0 Adjusted	OIDP>0 Adjusted
	Model I	Model II	Model III
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Survey year			
2007	1	1	1
2012	0.9 (0.8-1.1)	0.9 (0.8-1.1)	0.9 (0.8-1.1)
Dentist-patient relationship (2007)			
Info cost treatment			
No	1	1	1
Yes	1.4 (1.2-1.6)	1.2 (1.0-1.4)	1.1 (0.9-1.4)
Info hygiene			
No	1	1	1
Yes	1.3 (1.1-1.5)	1.3 (1.0-1.5)	1.2 (1.0-1.5)
Satisfaction care			
Dissatisfied	1	1	1
Satisfied	0.2 (0.2-0.3)	0.3 (0.2-0.5)	0.4 (0.3-0.5)
Unpleasant experience			
Yes	1	1	1
No	0.5 (0.4-0.6)	0.6 (0.5-0.7)	0.6 (0.5-0.7)
Want change dentist			
Yes	1	1	1
No	0.4 (0.3-0.5)	0.4 (0.3-0.6)	0.5 (0.3-0.6)
Socio-demographic covariates (2007)			
Sex			
Male	1	1	1
Female	0.7 (0.6-0.8)	0.8 (0.6-0.9)	0.8 (0.6-0.9)
Education			
Lower	1	1	1
Higher	0.8 (0.7-1.0)	0.9 (0.7-1.1)	1.0 (0.8-1.2)
Treatment cost			
Low	1	1	1
High	1.7 (1.4-1.9)	1.6 (1.4-2.0)	1.5 (1.3-1.9)
Dental care			
Annually	1	1	1
Less than annually	2.3 (1.9-2.8)	2.3 (1.7-2.8)	1.9 (1.5-2.5)
Avoidance behavior (2007/2012)			
Avoided proposed treatment			
No	1		1
Yes	3.8 (3.1-4.6)		2.0 (1.5-2.7)
Avoided dental visit			
No	1		1
Yes	3.7 (3.0-4.5)		1.9 (1.4-2.6)

