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Does different wording of a global oral health question provide different results?

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Abstract

Objective. Focusing on 70-year-old adults in Sweden and guided by the conceptual framework of International Classification of Impairments, Disabilities and Handicaps (ICIDH), the purpose of this study was to examine the extent to which socio-demographic characteristics, self-reported oral disease and social/psychological/physical oral health outcome variables are associated with two global measures of self-assessed satisfaction with oral health in Swedish 70-year-olds and if there is a degree of discordance between these global questions. ***Background.*** It has become an important task to create a simple way to measure self-perceived oral health. In these attempts to find practical ways to measure health, the 'global oral health question' is a possible tool to measure self-rated oral health, but there is limited knowledge about how important the wording of this question is. ***Materials and methods.*** In 2012, a questionnaire was mailed to all persons born in 1942 in two Swedish counties, Örebro (T) and Östergötland (E). The total population of 70-year-olds amounted to 7889. Bivariate analyses were conducted by cross-tabulation and Chi-square statistics. Multivariate analyses were conducted using binary multiple logistic regression. ***Results.*** The two global oral health question of 70-year-olds in Sweden was mainly explained by the number of teeth (OR = 5.6 and 5.2), chewing capacity (OR = 6.9 and 4.2), satisfaction with dental appearance (OR = 19.8 and 17.3) and Oral Impact on Daily Performance (OIDP) (OR = 3.5 and 3.9). ***Conclusion.*** Regardless of the wording, it seems that the concept of a global oral health question has the same main determinants.

Key Words: *elderly, global oral health question, OHRQoL*

Introduction

Although previous generations of psychologists, like Freud and Watson, distrusted self-reported well-being, contemporary psychologists take it very seriously [1]. This has also affected oral health research. A number of socio-dental indicators have been developed, but there are conflicting opinions on the values of different instruments [2]. Still, there is never-ending construction and validation of new instruments. In 1969, Lawton [3] stated that 'the present state of the trade seems to be one in which each investigator or practitioner feels an inner compulsion to make his own scale and cry that the other existent scales cannot possibly fit his own setting' (p. 179). Despite this, these instruments have a huge impact on research. Additionally, in many practical situations, it has been impossible to use these lengthy instruments. In attempts to find practical ways to measure health or oral health, the 'global health question' or 'global oral health question' is a possible tool [4].

The concepts of oral health and Oral Health-Related Quality-of-Life (OHRQoL) are commonly used and interpreted as similar concepts, although it has been acknowledged that they are distinct conceptually as well as empirically. Because neither of these concepts have a strict definition, it is important to define the stipulative meaning (special significance) of the discussed terms in every study to clarify their bearing when used. The concept of OHRQoL appeared in the early 1980s, much later than the general concept of Health-Related Quality-of-Life (HRQoL) [5]. Locker and Allen [6] stated that 'the claim that oral disorders affect the quality-of-life has yet to be clearly demonstrated' (p. 401). They also discussed the fact that, although health can be

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compromised, it does not automatically mean that Quality-of-life (QoL) is deteriorated, contrary to the assumptions embodied in the concept and measures of OHRQoL [6]. If that is the case, self-reported oral health status is not the same as OHRQoL, which can be defined as the impact of oral disorders on an individual's life as measured from their own point of view. This is in line with the suggestion that people assess their OHRQoL by comparing their expectations and experiences [7]. Finally, and despite diverse applications of this concept, the most important aspect of OHRQoL is to bring a patient rather than a body/mouth perspective into focus with the main point that addresses the question of whether it leads to a life worth living [8,9].

Whether the situation is similar regarding health or oral health, a single question about oral health seems not to have been studied in the same frequency as the primary outcome of oral health, even though interest in self-perceived oral health has increased rapidly during the last few decades among both patients and dentists [10]. The global (oral) health question is a measure often forgotten, although it 'functions largely as intended because it pulls together or summarizes the various components that make up the health domain status' (p. 940) [11]. Sometimes, this straightforward method can eliminate the inadequacy and bias in letting researchers choose and weigh a set of individual domains [12]. Because of its simplicity, it is an economical way of summarizing the state of a person's health and, as such, it is potentially useful to the research community as well [13]. Considerable research has also suggested that self-reported oral health outcomes have the potential to evaluate the effectiveness of dental therapies provided to older adults [14,15]. Studies have indicated associations between a global oral health question and self-perceived oral health, but there is little knowledge about how important the formulation of the global oral health question is [10,16]. There is a single study that compared different designs of a 'global oral health question' in which a discordance was found between self-rating of and satisfaction with oral health [17].

With all this said, it has become an important task to study differently formulated 'global oral health questions'. Focusing on 70-year-old adults in Sweden and guided by the conceptual framework of ICIDH, the purpose of this study was to examine the extent to which socio-demographic characteristics, reported oral disease and social, psychological and physical oral health outcome variables are associated with two global measures of self-assessed satisfaction with oral health in older Swedish adults (70 years old) and if there is a degree of discordance between these two global questions. It was hypothesized that there should be different important independent variables explaining the outcome variable if the global question is formulated differently.

Materials and methods

Ethical approval

The study was approved by the Ethics Committee in Uppsala in 2011 (Dnr 2011/336).

Population and response rate

In 2012, a questionnaire was mailed to all persons born in 1942 in two Swedish counties, Örebro (T) and Östergötland (E). The total population of 70-year-olds amounted to 3201 and 4688 in Örebro and Östergötland, respectively. Individuals not responding within 2 weeks were given a reminder by letter. If they still did not answer, a new questionnaire was sent. The final response rate was 72.2% (n = 5697 of the net population of 7889).

Generalizability/external validity

The study is part of a cohort study and was conducted in 1992–2012. The longitudinal study was based on five separate data collections conducted at age 50 (1992) and again after 5 (1997), 10 (2002), 15 (2007) and 20 years (2012). This survey, with a response rate above 70% in all five data collections, has been described in many previous studies [18–20]. The survey started as a collaborative project and the counties were chosen for convenience and not for the purpose of being representative of Sweden. Despite this, these two counties can represent Sweden in most aspects except for the most densely populated areas and some sparsely populated counties.

Conceptual model

Adulyanon and Sheiham [21] have described a conceptual model in which oral disease is linked to physical, social and psychological outcomes (Figure 1). Within this terminology, *oral disease* and *tissue damage* refers to disorders at the organic level or tissue loss. *Oral pain*, *discomfort*, *functional limitation* and *dissatisfaction with appearance* denote the immediate consequences of disease and tissue damage for dysfunction such as the inability to chew food adequately. *Oral disadvantage* (*Impacts on daily performance*) refers to the psychosocial and behavioral consequences of oral disease such as difficulties in performing daily activities. The final concept of *satisfaction with oral health* is the participant's expressed overall evaluation of oral condition; this incorporates expectations, values and social and cultural background and can be used as an indicator for OHRQoL. Specifically, this conceptual model hypothesizes a progression from distal oral health indicators such as oral diseases to more intermediate and proximal indicators such as pain, functional problems and oral

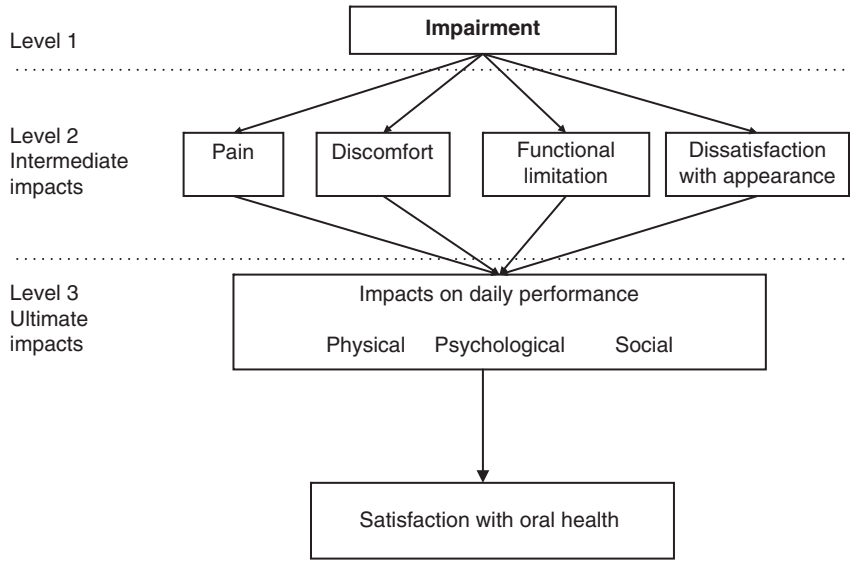

Figure 1. Current understanding of the framework of the ICIDH (adapted from Scheiham [21].

disadvantages. Distal determinants (e.g. oral disorder) might influence oral health perceptions directly or indirectly through factors at the intermediate (functional limitation) and proximal (oral disadvantage) levels of the hierarchy. Finally, proximal level determinants constitute the immediate direct influences on overall oral health perceptions. This study is based on a broad definition of OHRQoL and the dependent variable is *satisfaction with oral health* instead of *self-perceived oral health*. To ask people about their satisfaction with oral health seems to better harmonize with the chosen definition on OHRQoL than to ask for their view of oral health because it summarizes functioning, psychological aspects, discomfort and social aspects in one [9].

Questionnaire

The questionnaire was comprised of 58 questions. The questions were divided into socioeconomic conditions (e.g. age, gender, occupation), general health (e.g. physician visits, tobacco habits, drug consumption) and oral conditions (e.g. satisfaction with teeth and dental appearance, oral problems, oral hygiene habits, number of teeth). Finally, there were also eight questions about oral impact on daily performance (OIDP). In the first step, a number of variables from the questionnaire were selected from boxes in the chosen model (Figure 1). The questions and their dichotomization are presented in Table I. *Socio-demographic factors* were measured in terms of the country of birth, level of education and marital status. *Impairment* was assessed using two questions: 'How many of your own permanent teeth do you have?' and 'Have you during the last year had problems with caries?' *Pain* was assessed by three questions: 'Have you had one or more of the following oral health-related problems: toothache, burning mouth and temporo-mandibular joint (TMJ) pain?' *Discomfort* was assessed by three questions in terms of problems regarding dry mouth, bad breath and bleeding gums. *Functional limitations* were assessed in terms of problems regarding chewing food and were assessed with the question: 'Can you chew any kind of food?' *Dental appearance* was assessed with the question 'Are you satisfied with the appearance of your teeth?' *Oral disadvantage* was assessed using the eight-item OIDP. 'During the previous 6 months, how often have problems with your teeth or mouth caused you any difficulty with (1) eating and enjoying food, (2) speaking and pronouncing clearly, (3) tooth cleaning, (4) sleep and relaxation, (5) smiling and showing teeth without being embarrassed, (6) being emotionally stable, (7) being sociable, (8) performing daily chores'. Each item was scored from every or almost every day to never and was assessed using a 5-point scale; (1) 'never affected', (2) 'less than once a month', (3) 'once or twice a month', (4) 'once or twice a week' and (5) 'every or nearly every day'. Because the prevalence of impacts was anticipated to be low and also for practical purposes, a 5-point response scale rather than the original 6-point scale was used. Each item was dichotomized yielding the categories; (1) 'affected' (including the original categories 2, 3, 4 and 5) and (0) 'never affected' (original category 1). One sum index, the extent of oral impacts or OIDPSC, was constructed from the eight dummy variables. For the purpose of cross-tabulation analyses, the OIDPSC score (0–8) was dichotomized as 0/1, producing the categories (0) no daily activity affected and (1) at least one daily activity affected. The distribution of the OIDPSC scores supported this cut-off point. The reliability and validity of the Swedish version of the OIDP inventory has been established previously [22]. Finally, *Satisfaction with oral health status* was assessed using two questions: 'Are you in general satisfied with your teeth?' and 'Are

Table I. Frequency distribution of variables and their codes.

Variables	(original code)	Dichotomization [new code]	% (*n*)
Satisfaction with teeth§§	Yes, very satisfied (1), Yes, rather satisfied (2), No, not especially satisfied (3), No, absolutely not satisfied	Satisfied [2] (1,2) Unsatisfied [1] (3,4)	81.5 (4476) 18.5 (1016)
Satisfaction with mouth and teeth§§	Yes, very satisfied (1), Yes, rather satisfied (2), No, not especially satisfied (3), No, absolutely not satisfied	Satisfied [2] (1,2) Unsatisfied [1] (3,4)	86.3 (4712) 13.7 (750)
1. Remaining own teeth§	All (1), Missing some (2), Missing rather many (3), Have only few teeth left (4), Edentulous (5)	All teeth remained or missing some [2] (1,2) Missing many [1] (3,4,5)	72 (3895) 28 (1511)
2. Problems with caries in the last year§	Yes [1] No [2]	No [2] (1) Yes [1] (2)	79 (4203) 21 (1116)
3. Toothache§	During the last 3 months (1), During the last year (2), More than a year ago (3), Have never had toothache (4), Don't remember (5)	No/do not remember [2] (4,5) Remember toothache [1] (1,2,3)	56.1 (3061) 43.9 (2393)
4. Problems with burning mouth§	No problems (1), Some problems (2), Rather much problems (3), Considerable problems (4)	No problems [2] (1,2) Problems [1] (3,4)	98.7 (5123) 1.3 (67)
5. Problems with pain from TMJ§	No problems (1), Some problems (2), Rather much problems (3), Considerable problems (4)	No problems [2] (1,2) Problems [1] (3,4)	98.4 (5139) 1.6 (81)
6. Problems with dry mouth at night§	Yes, often (1), Yes, sometimes (2), No, seldom (3), No, never (4)	Often [2] (1,2) Seldom [1] (3,4)	48.6 (2572) 51.4 (2722)
7. Problems with bad breath§	No problems (1), Some problems (2), Rather much problems (3), Considerable problems (4)	No problems [2] (1,2) Problems [1] (3,4)	97.9 (5106) 2.1 (110)
8. Bleeding gum§	No problems (1), Some problems (2), Rather much problems (3), Considerable problems (4)	No problems [2] (1,2) Problems [1] (3,4)	98.3 (5149 1.7 (87)
9. Chewing function§	Very well (1), Rather well (2), Rather bad (3), Bad (4)	Good function [2] (1,2) Bad function [1] (3,4)	94.6 (5139) 5.4 (81)
10. Satisfaction with dental appearance§	Yes, very satisfied (1), Yes, mainly satisfied (2), No, not especially satisfied (3), No, absolute not satisfied (4)	Satisfied [2] (1,2) Not satisfied [1] (3,4)	82.3 (4528) 17.7 (973)
11. OIDP§	Daily or nearly daily (1), Once or twice a week (2), Once or twice a month (3), Less than once a month (4), Never (5)	No impact [2] (5) At least one impact [1] (1,2,3,4)	79.1 (4193) 20.9 (1111)
12. Country of birth§	Sweden (1), Nordic countries (2), Other countries (3)	Native country [2] (1,2) Foreign country [1] (3)	94.6 (5083) 5.4 (290)
13. Sex§	Male (1) [2] Female (2) [1]	Male [2] (1) Female [1] (2)	49.2 (2801) 50.8 (2896)
14. Education§	Primary school (1), Secondary school (2), High school (3), University (4), Other (5)	University) [2] (4) Less than university [1] (1,2,3,5)	25.6 (1436) 74.4 (4183)
15. Marital status§	Married/Partnership (1), Unmarried (2), Divorced (3), Widow/Widower (4)	Married/Partnership [2] (1) Single [1] (2,3,4)	75.0 (4026) 25.0 (1343)

§ dependent variable; §§ independent variable.

you in general satisfied with your mouth and teeth?' In the second step, only those variables with a correlation with satisfaction with teeth were included (Table II) ($p < 0.001$).

The complete questionnaire design, originally used in a study of 50-year-old participants in 1992, has previously been described [20]. A description of the 15-year follow-up examinations of these participants in 2002 has also been published [18].

Statistical methods

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, Release 17).

Table II. HRQoL regressed on socio-demographic characteristics, oral health-related behavior, clinical and non-clinical oral health indicators. Hierarchical logistic regression analysis.

	Adjusted OR						Adjusted OR (99% CI)	
Variables	Step 1	Step IIa	Step IIb	Step IIc	Step IId	Step III	Step IV Total	Total reduced version 1§ Total reduced version 2§§
Remaining teeth								
All teeth remaining or missing some	7.88***						6.06 (4.45–8.27)	5.63 (4.26–7.45)§ 5.18 (3.79–7.06)§§
Caries								
No problem	2.86***						2.35 (1.69–3.25)	
Toothache								
No problems		1.75***					0.99 (0.73–1.33)	
Burning mouth								
No problems		2.63***					1.98 (0.69–6.34)	
TMJ problem								
No problems		2.90***					0.93 (0.31–2.80)	
Dry mouth								
Often problems			0.70***				0.99 (0.73–1.32)	
Problem bad breath								
No problems			3.25***				1.98 (0.76–5.18)	
Bleeding gum								
No problems			4.48***				3.19 (1.22–8.33)	
Chewing								
No problems				44.07***			6.34 (3.07–13.10)	6.97 (3.67–7.45)§ 4.18 (2.71–8.21)§§
Satisfaction with appearance								
Satisfied					26.34***		18.90 (13.77–25.94)	19.82 (14.90–26.38)§ 17.37 (12.81–23.56)§§
OIDP								
No problems						8.88***	2.78 (2.02–3.84)	3.54 (2.54–4.44)§ 3.91 (2.88–5.31)§§
Nagelkerkes R^2	0.253	0.040	0.038	0.205	0.410	0.222	0.563	0.566

*** $p < 0.001$.
§ Dependent variable *Satisfaction with teeth*. Only those variables from the 'total' column with $p < 0.01$ were included. Two variables (caries and bleeding gums) were excluded due to problems with multicollinearity. No single SES variable (questions 12–15, Table I) reached statistical significance in the final model (not in the table).
§§ Dependent variable *Satisfaction with mouth and teeth*.

Bivariate analyses were conducted by cross-tabulation and Chi-square statistics. Multivariate analyses were conducted using binary multiple logistic regression with categorical data. Determinants of perceived oral health status were identified using logistic regression analysis whilst taking into account the hierarchical relationship between the various independent variables, as hypothesized by ICIDH (Figure 1). Oral health outcomes were grouped into a hierarchy ranging from distal determinants at step I (i.e. the number of remaining natural teeth) to proximal determinants in terms of reported symptoms and oral disadvantages (e.g. bad breath, OIDP) (at Step III). Initially, multiple logistic regression analyses were conducted with the variables of each step separately and independently and were selected for the total model (step IV) if $p < 0.01$ after adjustment for all the other 'same step' variables. With respect to the large samples analyzed, which entails that even very small differences and weak associations can reach statistical significance, the significance level was set to 1% ($p < 0.01$). Finally, and after a number of logistic regressions were performed, a model with a higher Nagelkerke's R^2 was achieved with a reduced number of variables (step V).

Results

Analysis of non-responders

There was no significant difference between the responders and the whole population as regards

county and gender. However, there was an over-representation among the responders with higher education (25.6%) compared to those with lower education (16.3%). A comparison of the socio-demographic characteristics of the study participants within each county with the corresponding population statistics indicated that, with some exceptions, the study groups were fairly representative of their respective populations (data not shown).

Determinants of satisfaction with teeth within a conceptual model

Oral health-related symptoms, functioning and the OIDP scores were associated with satisfaction with teeth, to a statistically significantly level ($p < 0.001$). These variables with their frequencies are presented in Table I. Table II depicts the adjusted odds ratios (ORs) for status by levels 1–4. Single variables were entered instead of summary scores at each step to clarify their relative importance as adjusted factors influencing perceived oral health. Impairment was entered in the first step, providing a model fit with Nagelkerke's $R^2 = 0.253$, while the remaining teeth and self-reported problems with caries were statistically significantly associated with satisfaction with teeth (Table II). Entering pain, discomfort, functional limitation and dental appearance in the second step providing a model fit with Nagelkerke's $R^2 = 0.040$, 0.038, 0.205 and 0.410, respectively. Finally, in the last separate step, step III, ultimate impacts were entered in the form of impartment on daily performance, providing a model fit with Nagelkerke's $R^2 = 0.222$. In the total model, step IV, remaining teeth, problems with caries, bleeding gums, chewing, dental appearance and OIDP maintained their statistically significant relationship with satisfaction with teeth after controlling for all variables in steps 1–3. Entering these variables raised the Nagelkerke's R^2 to 0.563. This model displayed some serious problems with multicollinearity and, to handle these, only the variables showing a statistically significant relationship with satisfaction with teeth in column IV were included in the reduced model (last column in Table II). Due to the same problem with multicollinearity, two more variables (problems with caries and bleeding gums) were excluded [23]. This final model raised the Nagelkerke's R^2 to 0.566. In this final step, participants who had many teeth, confirmed good chewing function, were satisfied with their dental appearance and experienced no oral impacts were more likely than their counterparts in the opposite groups to perceive good oral health. The corresponding ORs were 5.6, 6.9, 19.8 and 3.5, respectively.

Determinants of satisfaction with the mouth and teeth within a conceptual model

It was hypothesized that there should be differences in the result from the logistic regression if the outcome variables were formulated differently. Because of this, a differently formulated global oral health question was used as the dependent variable in the last reduced model (are you satisfied with your mouth and teeth) in Table II. The difference in the result from the first formulated global oral health question were minor, since participants who had many teeth, confirmed good chewing function, were satisfied with their dental appearance and experienced no oral impacts were more likely than their counterparts in the opposite groups to perceive good oral health. The corresponding ORs were 5.2, 4.2, 17.4 and 3.9, respectively. The only difference from the first question was that satisfaction with dental appearance and chewing seemed to have a slightly weaker effect.

Discussion

This study measured OHRQoL with two global questions. Such questions are important if measuring OHRQoL in clinical situations is a goal. The results from the study indicate that different formulations of the global oral health question are possible because the model performed equally well in both cases, explaining almost the same amount of variation. These variables were number of teeth, chewing capacity, dental appearance and oral impact on daily performance. It is in line with the results from other studies using more complex instruments. As Stenman et al. [24] stated, 'the use of dentures, having chewing problems and being dissatisfied with the appearance of teeth are associated with high OHIP-14 sums, indicating a strong influence on OHRQoL' (p. 445).

Multivariate analysis can be used to assess whether or not an effect is direct or mediated through other factors. In such cases, it is important to choose factors for the model that are not only based on statistical associations [25]. This study used a conceptual model adapted from the WHO and factors that were incorporated into the work were partly based on the scope of this survey and partly from earlier studies. In accordance with the propositions of ICIDH, the present results confirmed the relationships between satisfaction with oral health and remaining teeth, chewing, dental appearance and OIDP in the model, suggesting that responses regarding satisfaction with oral health in 70-year-old Swedish adults might be explained by variables organized into three conceptual domains. In accordance with what has been reported in other studies [22,26], oral health indicators at various levels of the conceptual hierarchy influenced the overall responses to oral health status positively and significantly, but differently. This result indicates that both '*satisfaction with teeth*' and '*satisfaction with mouth and teeth*' for most responders brings not only the teeth but also the mouth and finally a more complex patient perspective into focus. Despite

this, there was a significant difference ($p < 0.001$) between the frequencies of those who were satisfied with their *teeth* (81.5%) and those who were satisfied with their *teeth and mouth* (86.3%). This indicates that the latter OHRQoL-indicator is a broader concept, so people can be satisfied with their *mouth and teeth* even if they are not are satisfied with their *teeth*.

This study represents the first large population-based study comparing two formulations of a global oral health question and is both consistent and inconsistent with what has been reported in studies elsewhere [26,27]. In contrast to some other studies, the overall response of the participants regarding satisfaction with teeth or satisfaction with mouth and teeth was only weakly influenced by their socio-demographic context. Variations in satisfaction with teeth according to the country of birth, education and marital status, observed in the bivariate analysis, disappeared after having included the number of maintained teeth, satisfaction with dental appearance, chewing and OIDP, suggesting that those effects were accounted for by variation in all three levels of measurement in this model [28]. This agrees with the evidence that culturally-based attitudes and perceptions influence individual expectations and reactions to their oral condition, thereby determining whether those conditions lead to impacts and reduced well-being. As Tickle et al. [27] stated, 'This finding confirms that the individual's socio-economic circumstances are of secondary importance to pain and functional problems in determining the psychosocial effects of oral conditions'(p. 217).

The strength of the present study is the application of a conceptual framework to guide the statistical analyses and the interpretation of the results. Failure to take such a conceptual framework into consideration by entering all explanatory variables at the same time might under-estimate the effect from more distal variables in the conceptual hierarchy [25]. The independent variables chosen for the conceptual framework utilized here were based on logical reasoning as well as statistical associations [25]. Using latent constructs with Structural Equation Modeling (SEM) would have provided a stronger test of the construct validity of the model, examining its factorial structure, the equivalence of this factor structure across groups and controlling measurement errors present in the observed variables [29]. Such an approach is suggested for subsequent studies. Another strength is the number of responders and the response rate over 70%, the census approach and the possibility to do further studies from a longitudinal perspective. Nevertheless, limited variables were compared and some discrepancies which might have influenced the results should be noted. Since the present data rely on self-reporting, the recorded oral health indicators might have been biased by under- or over-reporting due to socially desirable responses and the poor recall effect. However, the core questions utilized have shown good validity and reliability in previous national and cross-national surveys. On the other hand, there is no reason to assume that the accuracy of the reported oral health aspects differed within the survey, suggesting that the comparison of estimates presented here is likely to be reasonably accurate.

Conclusion

The oral condition of 70-year-olds in Sweden produced impacts in terms of oral symptoms, functional limitations and problems with daily activities. The global oral health questions at this age are mainly concerned with the number of teeth, chewing capacity, satisfaction with dental appearance and impacts on daily activities (OIDP). The concept of 'satisfaction with teeth' seems to have the same determinants as the concept of 'satisfaction with the mouth and teeth', even if the first approach gives a more narrow perspective. Both questions can be used by clinical dentistry to engage the patient in decisions of importance regarding her/his future oral health.

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