

What Do Older Adults' Global Self-ratings of Oral Health Measure?

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Abstract

Objective: Although global self-ratings of oral health are widely used in oral health research, the frames of reference on which older people's ratings are based are not known. This study used a quantitative approach in order to identify these referents. **Methods:** Data were collected from 498 dentate subjects aged 53 years and over who took part in the second stage of a three-phase longitudinal epidemiological and sociodental study. Data were obtained by means of a personal interview and clinical oral examination and a self-complete version of the 49-item Oral Health Impact Profile (OHIP). These data were used to construct measures of oral disorders, oral symptoms, the functional and psychosocial impacts of oral disorders, health behaviours and contextual variables such as general health status, socioeconomic status and sociodemographic characteristics. Bivariate and linear regression analyses were used to identify which of these variables predicted self-ratings of oral health. **Results:** One quarter of subjects stated that their oral health was only fair or poor. At the bivariate level most variables were associated with self-ratings of oral health. The regression model for all subjects indicated that the most important predictor of these self-ratings was the OHIP functional limitations subscale score. This explained 23% of the variation in the self-ratings. Six other variables entered the model and increased the R^2 value to 0.36. There was some variation in the models and the influence of various factors by age and educational attainment. **Conclusions:** The results suggest that the referents that inform older adults' ratings of oral health are broadly similar to those that have been reported to inform their ratings of general health and differ across groups.

Key Words: older adults, self-rated oral health, subjective health, age and gender differences

Introduction

Asking individuals to rate their health on a scale ranging from excellent to poor has become a standard practice in population-based health surveys and health evaluations (1). The consensus is that these single-item ratings provide a summary of how people perceive their health, both objective and subjective, and that they may be as useful as more complex multi-item scales and indexes in health status assessment (2). There is also a substantial body of research indicating that these ratings are powerful predictors of both functional decline and survival (3, 4) and predict use of health care services (5). As summary indicators they are also used to test the construct validity of patient-

based measures of health-related quality of life.

However, it is not altogether clear what frame of reference people use when rating their oral health and the cognitive processes that lead to particular self-evaluations of health status (1). Research on self-rated general health has indicated that respondents use different frames of reference in their answers to these global questions (6-8). While some rate themselves according to their physical state, others refer to their emotional state. Some respondents base their rating on comparisons with others, (as in a similar age cohort) (6-8), while some make reference to behaviours which promote or compromise health. Kaplan and Baron-Epel (1) conducted

in-depth interviews with adults and identified three models used to evaluate health status. These were the biomedical or disease model, the emotional or general feeling model and the functional model. Krause and Jay (7) identified nine conceptually distinct dimensions that provided the basis for self-assessments of health, with the presence or absence of specific medical problems being the most common. Other studies have also suggested that while ratings of health can be based on many referents, the presence or absence of disease states and physical functioning are the most prominent (9-11). Some of these studies reported variations in the referents used according to the demographic characteristics of respondents. There was also an indication that those rating their health as unfavourable used somewhat different criteria in their self-evaluations than those who rated their health more favourably.

Comparable research has not been undertaken with respect to self-ratings of oral health. Consequently, it is currently unclear whether or not the same frames of reference are used in rating both oral and general health and whether or not there are age or gender differences in the dimensions that underlie respondents' evaluations of oral health. Understanding why people rate their oral health in various ways is also of importance since these ratings have been shown to be independent predictors of concurrent and future self-ratings of general health (12) and predictors of concurrent proxy measures of quality of life such as self-esteem, morale and life satisfaction (12-14).

Two approaches have been used to study the frames of reference or dimensions underlying self-ratings of general health; quantitative and qualitative (7). The first involves the use of regression or correlational analyses to assess the associations between multi-item, multidimensional measures of health status and single item global ratings of health.

These analyses indicate which of the sub-scales or items comprising those measures predict the categories of the self-rating. By contrast, the qualitative approach uses open-ended questions to explore the frames of reference underlying perceptions of health (1,7).

The quantitative approach has been subject to a number of criticisms. The main problem is that the scales and items used as predictor variables are based on assumptions about the dimensions or factors that are important in shaping people's evaluations of their health (7). Consequently, with this type of approach, dimensions or factors not captured by the measure are not included in the analysis. This may be why, in these analyses, much of the variation in self-rated health is not accounted for even when sociodemographic factors are included in explanatory models. However, a quantitative approach can provide useful insights into the frames of reference or dimensions shaping self-ratings of health if the measure used is based on qualitative methods and has adequate content coverage and content relevance. Then it should capture at least some of what can be obtained from a qualitative approach.

This paper uses such a measure, the Oral Health Impact Profile (15), to explore predictors of self-rated oral health in a community-dwelling population of dentate older adults and to determine if those predictors vary by age and gender. The study was confined to the dentate because of the availability of more comprehensive clinical data than can be collected from the edentulous. Based on previous research into self-ratings of global health, the predictors included in the analysis included indicators of oral disease, measures of symptoms

and the functional and psychosocial impacts of oral disease and sociodemographic and other personal factors such as health behaviours.

Methods

Study design. The data on which the paper was based were collected as part of the second stage of a three-phase longitudinal epidemiological and sociodental study of the oral health of community dwelling adults who were aged 50 years and over at baseline. Participants were originally recruited by means of a telephone interview survey based on random digit dialing. A sub-sample were subsequently interviewed in person and clinically examined for evidence of oral disease. Three years later all subjects taking part in the interview and clinical examination at baseline were followed up and those who agreed were interviewed and examined again. At this stage they also completed a copy of the 49-item version of the Oral Health Impact Profile (OHIP) (15). A seven-year follow-up was also undertaken. However, this paper is based on data from the three-year phase since OHIP data were available at that phase and the sample size was reasonable.

All phases of the study and all study procedures were approved as ethical by the University of Toronto's Human Subjects Certification Committee.

Measures

Oral diseases and disorders. These included measures of tooth loss, coronal and root caries and periodontal disease. Periodontal disease was measured using the Extent and Severity Index (16), based on measures of clinical attachment level at two points on each remaining tooth. The data allowed for estimates of mean periodontal attachment loss and the proportion of sites examined with loss of 2mm or more.

Symptoms and compromised physical and psychosocial functioning. These were assessed using the first six of the seven subscales of the Oral Health Impact Profile (15);

namely; functional limitations, physical pain, psychological discomfort, physical disability, psychological disability and social disability. The handicap scale was not used since this was deemed to be a measure of quality of life that, in contemporary models of disease and its outcomes (17) is influenced by rather than influences perceptions of health. Each OHIP item asks about the frequency with which certain problems have been experienced in the past year because of the state of the teeth, mouth or dentures. The response format was a Likert type frequency scale with the following options and codes; never (0), hardly ever (1), occasionally (2), fairly often (3) and very often (4). Sub-scale scores were calculated by summing the response codes for the items comprising each sub-scale.

Global ratings of oral health. Self-rated oral health was assessed using the conventional question "How would you describe your dental health?", with five response options: excellent, very good, good, fair and poor.

Health behaviours. Single items were used to assess the frequency of tooth brushing, flossing and use of other interdental cleaning devices. The response format was a seven-point frequency scale as follows; never, once a month, a few times a month, once a week, a few times a week, once a day and twice a day. Between-meal snacking was assessed using the following frequency response scale; rarely or never, occasionally but not every day, once a day, twice a day, three times a day. Data on the use of fluoride-containing products and whether or not the individual avoided sugary foods to promote oral health were also obtained using single items with a yes/no response format. Subjects were classified as current smokers or not currently smoking. Dental visiting behaviours were assessed by two questions; usual dental visiting pattern (at least one a year for a check-up, from time to time for a check-up, only when having pain or other problems, never) and time since last dental visit (within the last 6 months; 6

months to 11 months, 1 to 2 years, 3 years, not within the last 3 years).

Sociodemographic and other personal factors. These included age (in years), gender, and educational attainment. Socioeconomic status was assessed using information on total annual household income categorized in increments of \$10,000 and ranging from 'less than \$10,000' to '\$100,000 or above', and the extent to which financial resources were adequate to meet needs (very well, adequate, not very well, totally inadequate). General health was assessed by means of a global self-rating (excellent, very good, good, fair, poor, very poor), the number of chronic medical conditions and the number of limitations in activities of daily living from a list of nine such as difficulty in dressing, bathing and doing household chores. A single item global rating of life stress was also obtained.

Data analysis

Bivariate analyses were undertaken to assess the associations between each independent variable and self-ratings of oral health. Spearman's rank correlation coefficients were used for continuous or ordinal independent variables and the Chi-square test was used for categorical variables. Statistical significance was set at $p < 0.05$.

Next, multiple linear regression analysis was undertaken to determine which of the predictor variables had independent effects. Linear regression analysis is considered appropriate when the dependent variable is ordinal if its relationships with the independent variables conform to the assumptions of linear regression analysis (18). Normal probability plots of standardized residuals confirmed that these assumptions were met. All variables showing significant associations at the bivariate level were included in an analysis using forward stepwise procedures. This stepwise regression analysis was undertaken for all subjects and then separately for the following subgroups: males, females; those aged 69 and under, those aged 70 years and

TABLE 1
Characteristics of study subjects

Characteristic	Mean (SD) or percent
Mean	
Number of missing teeth	9.1 (7.7)
Number of decayed teeth	0.6 (1.2)
Periodontal attachment loss (mm)	2.66 (1.43)
Number of teeth lost in last 3 years	0.37 (1.11)
Percent	
One or more decayed teeth	32.2%
Losing one or more teeth in previous 3 years	18.0%
Wearing partial denture	47.4%
Rating general health as fair or poor	17.7%
One or more chronic medical conditions	86.1%
One or more limitations of daily activities	16.5%
Household income less than \$20,000 per annum	23.2%
Reporting assets inadequate for needs	17.7%
More than high school education	45.0%
Reporting high life stress	13.5%

over, those with high school or less education, and those educated beyond high school. All analyses were undertaken using SPSS Version 10.0.

Results

Response and characteristics of participants. At baseline 907 subjects completed the interview and clinical examination component of the study. Three years later 611 subjects took part the second interview and examination. The reasons for loss to follow-up were: deceased ($n=39$), unable to locate ($n=121$) and refused/too ill to participate ($n=136$). If those known to have died are excluded, follow-up rates were 70.4% for the sample overall, 73.2% for the dentate and 59.3% for the edentulous (19). Subjects who were edentulous at the second phase were excluded from the analyses reported here so that the results are based on 498 dentate individuals. A comparison of the characteristics of dentate subjects who did and did not complete the second phase of the study revealed that those retained in the study were healthier, more likely to use dental services on a regular basis and had better periodontal health (19). However, the magnitude of differences between those lost and retained were small.

At the time of the second phase subjects were aged 53 years and over with a mean age of 65.2 years ($SD=8.3$ years). Just over half, 54.4%, were

female. Their oral health and other sociodemographic and personal characteristics are summarized in Table 1.

Self-rated oral health. The distribution of self-ratings of oral health were as follows: excellent – 13.3%, very good – 26.4%, good– 36.4%; fair 17.5% and poor – 6.6%.

Bivariate associations. All measures of oral disease/disorder were associated with self-rated oral health (Table 2). Those with greater levels of tooth loss, periodontal disease and decay experience were more likely to rate their oral health as only fair or poor. The only exception was for the number of filled teeth where the correlation coefficient was negative. All six OHIP sub-scale scores showed significant positive associations with self-rated oral health, indicating that those reporting more symptoms, dysfunction and disability had poorer perceived oral health. Five of the nine variables measuring health behaviours were associated with self-ratings; those who brushed their teeth infrequently, flossed infrequently, currently smoked, had a symptomatic dental attendance pattern and had not seen a dentist in the last three years were more likely to rate their oral health as fair or poor. Males had poorer self-ratings than females but there was no association with age. Those with lower levels of educational attainment, living in lower in-

TABLE 2
Associations between self-rated oral health and the independent variables

Independent variable:	Spearman's r	p-value
<i>Measures of disease/disorder</i>		
Number of missing teeth	0.30	<0.001
Number of decayed teeth	0.25	<0.001
Number of filled teeth	-0.19	<0.001
Mean periodontal attachment loss (mm)	0.23	<0.001
Proportion of periodontal sites with loss of X+ mm	0.16	<0.001
Wearing partial denture	*	<0.001
At least one tooth lost in last 3 years	*	<0.001
OHIP sub-scale scores		
Functional limitation	0.42	<0.001
Pain	0.35	<0.001
Psychological discomfort	0.41	<0.001
Physical disability	0.33	<0.001
Psychological disability	0.37	<0.001
Social disability	0.25	<0.001
Health behaviours		
Frequency of brushing	-0.15	<0.001
Frequency of flossing	-0.17	<0.001
Frequency of use of interdental cleaning device	0.01	NS
Use of fluoride	*	NS
Frequency of between meal snacking	0.04	NS
Avoidance of sugary foods	*	NS
Current smoking status	*	<0.001
Dental visiting pattern	0.22	<0.001
Time since last dental visit	0.14	<0.001
Sociodemographic/personal variables		
Gender	*	<0.05
Age	-0.05	NS
Educational attainment	0.18	<0.001
Income	0.18	<0.001
Assets adequate for needs	0.19	<0.001
Self-rating of general health	0.34	<0.001
Number of chronic medical conditions	0.12	<0.001
Limitations in ADL	0.08	NS
Life stress	0.13	<0.001

* Categorical variable; p-values obtained from Chi-square test

TABLE 3
Results of the final model from the stepwise regression analysis including all subjects: Dependent variable – self-rated oral health

Independent variable:	Standardized regression coefficient	p-value	R² at each step
Functional limitations score	0.209	<0.01	0.23
Self-rated general health	0.164	<0.01	0.27
Psychological discomfort score	0.251	<0.001	0.29
Time since last dental visit	0.128	<0.01	0.32
Mean periodontal attachment loss	0.152	<0.01	0.34
Age	-0.116	<0.01	0.35
Educational attainment	-0.103	<0.05	0.36

F=25.52; p<0.001

come households and reporting that their assets were not adequate to meet their needs were more likely to perceive their oral health as fair or poor. Self-ratings of oral health were also associated with self-rated general health, the number of chronic medical conditions and life stress ratings in the expected directions.

Results of the regression analyses. The stepwise regression analysis for all subjects resulted in a model containing seven variables and had an associated R² value of 0.36 (Table 3). The model contained one variable denoting oral disease (mean periodontal attachment loss); two OHIP sub-scales scores (functional limitation and psychological discomfort), one variable assessing health behaviours (time since last dental visit), and three variables denoting personal characteristics (self-rating of general health; age and educational attainment). The regression coefficients for age and educational attainment indicated that older subjects and those with high levels of education had more favourable ratings than younger and less well-educated subjects. The first variable to enter the model was the OHIP functional limitations sub-scale score, which alone explained 23% of the variance in self-ratings.

The separate models for males and females each contained five variables with associated R² values of 0.36 and 0.37 respectively. The model for females was similar to the model for all subjects and included variables denoting oral disease, functioning, oral health behaviours and general health status. The model for males contained these variables with the exception of measures of oral disease. In both models, the OHIP functional limitations sub-scale score entered first and accounted for the greater part of the variance explained (R² values of 0.19 for males and 0.26 for females).

The models for younger subjects (aged 69 years and under) and older subjects (70 years and over) were somewhat different. For younger subjects the OHIP functional limitations

sub-scale score was again the most important variable, accounting for the majority of the variance explained. Two other OHIP sub-scales scores (psychological discomfort and physical disability) entered the model along with mean periodontal attachment loss, dental visiting pattern and self-rated general health. The model for the older subjects consisted of three variables that explained 42% of the variance in self-rated oral health. The psychological disability sub-scale score rather than the functional limitations score had the greatest independent effect with an R^2 of 0.35. Smoking status, which did not appear in any of the previous models also entered the model for the older subjects. However, the model was similar to all others in that the self-rating of general health status had a significant independent effect.

The models for the groups defined by educational status were also different. The model for those with high school education or less contained only three variables; the functional limitations sub-scale score, mean periodontal attachment loss and age. No health behaviour variables entered the model, nor did self-rated general health. The associated R^2 of 0.25 was the lowest of all the models. The model for those with more than high school education was similar to the model for all subjects. Both the functional limitations and psychological discomfort scores entered, although the latter entered first and accounted for the majority of the variance. Also, this model contained two health behaviour variables; time since last dental visit and frequency of flossing. The R^2 value was also relatively high at 0.44.

Discussion

Because of their predictive validity, particularly with respect to mortality, a number of studies have explored the factors that appear to inform self-ratings of general health. The qualitative study by Krause and Jay (7) found that 45% of respondents explained their ratings by reference to the presence or absence of health problems, 20% to physical function-

TABLE 4
Summary of the regression analyses for sub-groups:
Variables entering the stepwise models and R^2 values at each step

Gender			
Males		Females	
Variable:	R^2	Variable:	R^2
Functional limitations	0.19	Functional limitations	0.26
Frequency of flossing	0.28	Psychological discomfort	0.30
Age	0.32	General Health rating	0.33
General health rating	0.34	Mean PAL	0.35
Psychological disability	0.36	Time since last dental visit	0.37
F=16.23	p<0.001	F=20.37	p<0.001
Sub-groups - Age			
69 years and under		70 years and over	
Variable:	R^2	Variable:	R^2
Functional limitations	0.22	Psychological disability	0.35
Mean PAL	0.28	General health rating	0.39
General health rating	0.30	Smoking status	0.42
Dental visit pattern	0.32		
Psychological discomfort	0.34		
Physical disability	0.35		
F=20.65	p<0.001	F=21.63	p<0.001
Educational Attainment			
High school or less		More than high school	
Variable:	R^2	Variable:	R^2
Functional limitations	0.21	Psychological discomfort	0.28
Mean PAL	0.23	Time since last dental visit	0.37
Age	0.25	General health rating	0.40
		Duncational limitations	0.42
		Frequency of flossing	0.44
F=18.49	p<0.001	F=23.48	p<0.001
All independent variables in all models significant at p<0.05			

ing or their general physical condition and 24% to positive and negative health behaviours. Kaplan and Baron-Epel (1) also used a qualitative approach and found that biomedical/disease and functional issues were also important in shaping their respondents' conceptions of health. Healthy behaviours and lifestyles were rarely invoked but references to general feeling and emotional states were common. Similar results have also been reported by Manderbacka (9) and Benyamini, Levental and Leventhal (11).

In the quantitative study reported here, these type of referents emerged as predictors of older adults' ratings

of oral health. When all subjects were considered, functional considerations were the most important factor that differentiated between those reporting varying levels of oral health.

This influence of this variable was also fairly consistent in the regression analyses conducted with sub-groups of respondents. The OHIP psychological discomfort sub-scale score was also a predictor of perceptions of oral health. Since its items address states such as being worried, tense, miserable and self-conscious it is consistent with the emotional/general feeling model described by Kaplan and Baron-Epel (1). Indicators of oral disease, predominantly mean periodon-

tal attachment loss, and health behaviours in the form of dental visits, smoking or flossing also entered one or more models. This may indicate that knowledge of and conformity to oral health promotion messages concerning healthy lifestyles have an influence on subjective perceptions of oral health (9).

These results suggest that the broad referents used in self-ratings of general health may well underlie self-ratings of oral health. However, in order to be more certain that this is the case, studies are needed in which the same group of respondents are asked to rate both their general and oral health and to give the reasons for their respective ratings.

One variable that appeared in the majority of the regression models was self-rating of general health. That is, those rating their general health unfavourably were more likely to rate their oral health unfavourably after controlling for the other variables in the models. It is not immediately apparent why this variable had such a consistent effect, although a number of explanations can be suggested. First, it may reflect the essential unity of what we refer to as general and oral health. That is, while it is usually the case that these are regarded as different constructs, this may be an expert rather than a patient-based formulation. Second, it may be due to the fact that general and oral health, although distinct constructs, are often empirically linked so that those with objectively assessed poor general health tend to have poor oral health and vice versa. Third, it may be a reporting or perceptual artefact, indicative of psychological traits such as negative affectivity (20).

The findings of this study also agree with earlier work that suggests that the referents used in rating health vary according to age and other factors. The most noticeable differences were with respect to those aged 70 and over and those with lower levels of education. While functional limitations was the most important predictor for younger subjects, psychological disability was most important for older subjects and alone explained

35% of the variation in ratings. The model for those with lower levels of education was also distinct in that it did not include variables denoting general health status and health behaviours and lacked explanatory power. The main variables entering the model, functional limitations and mean periodontal attachment loss, may indicate that for this social group self-ratings are based on more tangible and perceptually available factors rather than on more holistic and contextual factors. These results suggest that, as with self-ratings of general health, self-ratings of oral health may be measuring different things in different population sub-groups. However, it would be a mistake to overinterpret what are preliminary findings until they have been replicated or explored further.

While quantitative work can produce useful insights it does have some limitations. First, the functional and psychosocial predictors entering the models are those that are contained within the OHIP that, despite its content validity, may not fully encompass all of the referents older adults use in rating their oral health. The study did not include questions that would have enabled us to determine if older adults compare themselves with others in making self-evaluations. In the study by Kaplan and Baron-Epel (1), the majority of the subjects reported that such comparisons did inform their judgements even though they were not explicitly asked to rate their health compared to others of the same age and gender. Feinberg, Loftus and Tanur (21) have suggested that in making self-ratings older adults may also compare their health status with their health at some prior point in time so that perceived changes may inform current judgements about health. This process of comparison has been used to explain why older people are able to maintain positive views of their health even though their objective health may be relatively poor. The omission of other potential referents and comparison processes from our analyses may explain why in this study the R^2 values associated with the models were comparable with

those reported in quantitative studies of general health ratings (6, 22), but left a lot of the variation in the ratings of oral health unexplained.

Second, in quantitative research, the global ratings and their presumed underlying referents are linked statistically rather than being linked specifically in respondents' accounts of their oral health and its impact on daily life. This is particularly the case with the oral disease variables used in this study. Data on oral disorders was collected by means of a clinical examination rather than by respondent self-reports. Although it is likely that the respondents were aware of disease experience indicators such as missing and filled teeth, we cannot be certain whether or not the respondents were aware of the extent of periodontal attachment loss, the main disease predictor of subjective perceptions of oral health. Consequently, quantitative research can identify the predictors of global self-ratings but not the meanings of oral health to the respondents (9). Qualitative research, in which older adults can be asked to explain why they rate their oral health in particular ways, is needed in order to be sure that the kinds of functional, emotional and disease-related issues described here do in fact directly inform conceptions of oral health in this section of the population. These comments also apply to our findings with respect to variations in the referents used according to age and education.

Again, we have demonstrated variation in predictors between different groups rather than variations in meanings. The assessment of the latter would require qualitative data collection methods and studies with sample sizes sufficiently large to quantitatively analyze variations in meanings. While methodologically challenging, such studies would allow us to be more certain that what is being measured by global self-ratings of oral health does in fact differ between individuals and groups. If this is the case, it will have implications for how these simple global ratings should be used and interpreted in oral health services research.

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