

(Reprinted from: Slade GD, ed. Measuring Oral Health and Quality of Life. Chapel Hill: University of North Carolina, Dental Ecology 1997.)

THE ORAL HEALTH IMPACT PROFILE

**Gary D. Slade, B.D.Sc.,
D.D.P.H., Ph.D.**

Correspondence to:

Gary D. Slade, B.D.Sc, DDPH, PhD, Department of Dental Ecology,
University of North Carolina, CB#7450, Chapel Hill, NC 27599-
7450, USA. Email: gary_slade@dentistry.unc.edu

BACKGROUND

The Oral Health Impact Profile (OHIP) was developed with the aim of providing a comprehensive measure of self-reported dysfunction, discomfort and disability attributed to oral conditions. These impacts were intended to complement traditional oral epidemiological indicators of clinical disease, thereby providing information about the "burden of illness" within populations and the effectiveness of health services in reducing that burden of illness.¹

The OHIP is concerned with impairment and three functional status dimensions (social, psychological and physical) which represent four of the seven quality of life dimensions proposed by Patrick and Bergner.² Hence, it excludes perceptions of satisfaction with oral health, changes in oral health, prognosis or self-reported diagnoses. Furthermore, the OHIP aims to capture impacts that are related to oral conditions in general, rather than impacts that may be attributed to specific oral disorders or syndromes. All impacts in the OHIP are conceptualized as adverse outcomes, and therefore the instrument does not measure any positive aspects of oral health.

DEVELOPMENT OF THE INSTRUMENT

The development of the OHIP followed approaches that had been used in general health settings to measure the impact of medical care on functional and social well-being.^{3,4} The approach involved identifying a conceptual model that defined relevant dimensions of impact then acquiring a broad range of questions and associated numerical weights which could be combined to create subscale scores reflecting both the frequency of each impact and lay judgments about the severity of the impact. The three steps, which have been described previously,⁵ are summarized below.

Conceptual model. Locker's model of oral health⁶ was used to define seven conceptual dimensions of impact: functional limitation (e.g., difficulty chewing), physical pain (e.g., sensitivity of teeth), psychological discomfort (e.g., self consciousness), physical disability (e.g., changes to diet), psychological disability (e.g., reduced ability to concentrate), social disability (e.g., avoiding social interaction) and handicap (e.g., being unable to work productively). This model is based on the World Health Organization's classification⁷ in which impacts of disease are categorized in a hierarchy ranging from internal symptoms, apparently primarily to the individual (represented in the

dimension of functional limitation), to handicaps that affect social roles, such as work.

Statements about impact. Interviews using open ended questions with a convenience sample of 64 dental patients were conducted to identify statements about adverse impacts of oral conditions. The interviews took place in Adelaide, Australia, among adult patients at public and private dental care settings. Interviews yielded a total of 535 statements which were examined for content resulting in the derivation 46 unique statements that were categorized into the seven conceptual dimensions. Three additional statements from an existing inventory⁴ were adapted for use in the handicap dimension.

Weights. Thurstone's method of paired comparisons⁸ was used to generate weights for statements within each conceptual dimension. Judgments about the perceived unpleasantness of each impact were recorded by 328 people who were members of community groups or university students in Adelaide. All weights were adjusted to positive numbers which ranged from 0.747 to 2.555. Some variation was observed when weights were computed among sub-groups: for example, in the physical pain dimension, wearers of full dentures accorded greater weight to sore spots in the mouth and less to sensitivity of teeth compared with non wearers of dentures. However, a replication of the weighting procedure in Canada found that the ranking of OHIP items made by South Australians were broadly similar to the rankings made by English-speaking people in Ontario and French-speaking people in Quebec.⁹

Structure of the questionnaire. The OHIP questionnaire consists of the 49 statements that have been rephrased as questions, reproduced at the end of this Chapter (Table 0.2). Respondents are asked to indicate on a five-point Likert scale how frequently they experienced each problem within a reference period, for example 12 months. Response categories for the five-point scale are: "Very often", "Fairly often", "Occasionally", "Hardly ever" and "Never". Respondents may also be offered a "don't know" option for each question. For three questions that ask about denture-related problems (numbers 17, 18 and 30), a response option is provided for non-wearers of dentures to indicate that these questions do not apply to them.

Scoring. For data entry, responses are coded 0 (never or not applicable), 1 (hardly ever), 2 (occasionally), 3 (fairly often) or 4 (very often). "Don't know" responses and blank entries are entered as missing values, which subsequently are recoded with the mean value of all valid responses to the corresponding

question. However, if more than nine responses are left blank or marked "don't know", the questionnaire is discarded. During data processing, coded responses are multiplied by the corresponding weight for each question (Table 0.2) and the products summed within each dimension to give seven subscale scores, each with a potential range from zero (no impact) to 40 (all impacts reported "very often").

Overall OHIP scores have been computed in two ways. The simplest method is to count, for each subject, the number of impacts reported at a threshold level (for example, "fairly often" or "very often"). In many populations, the distribution of this summary variable may be skewed, with many individuals reporting no impact at this threshold,¹⁰ and this may violate assumptions necessary for some parametric statistical procedures. The second method of computing an overall OHIP score is to standardize subscale scores (subtract the sample mean subscale value from each individual's subscale score and divide the result by the sample standard deviation for that subscale, creating seven "z-scores"), and then sum those standardized scores for each respondent.⁵ Typically, the resulting standardized OHIP score has a better distribution for parametric statistical procedures.¹¹ However, this second method requires more computer programming, and the resulting scores have less intuitive appeal than the simpler count of impacts.

EVALUATION OF THE INSTRUMENT

Reliability of the OHIP was first evaluated among a random sample of 122 people aged 60+ years who were residents of Adelaide.⁵ Cross sectional results were used to generate Cronbach alpha coefficients for internal reliability, which ranged from 0.70 to 0.83 for six subscales, but only 0.37 for handicap. Follow-up administration of the instrument among 46 of those subjects was used to calculate intra-class correlation coefficients of test-retest reliability which ranged from 0.42 to 0.77 for six subscales, but only 0.08 for social disability. In a cross-sectional study of a random sample of people aged 50+ years in Ontario, Canada, Cronbach alpha coefficients for all subscales ranged from 0.80 to 0.90.¹² In another study of older adults in North Carolina, reliability was analyzed separately by race (white and black) and education (<8 years and 8+ years of education) and Cronbach alpha coefficients for the full 49-item questionnaire were 0.96 or more for each group.¹¹

Construct validity was assessed through cross-sectional comparisons of OHIP responses and related, self-reported

measures. In the study of 122 elderly Adelaide residents, OHIP subscale scores were greater ($P < 0.05$) among people who perceived a need for treatment compared with those who did not.¹⁰ There was a similar association between the total number of OHIP items and perceived treatment needs in the Ontario study.¹² In addition, this summary OHIP score had moderately strong, statistically significant correlations with indices of self reported chewing ($\rho = 0.47$), self-reported oral pain ($\rho = 0.41$), other oral symptoms ($\rho = 0.34$), self-reported problems with eating ($\rho = 0.68$) and satisfaction with oral health ($\rho = 0.48$). Relationships between OHIP scores and clinical variables (such as missing teeth, decayed teeth and periodontal destruction) followed hypothesized directions, although as expected, correlation coefficients were only moderately strong.¹³

FINDINGS FROM THE USE OF THE INSTRUMENT

An example of the distribution of OHIP scores is provided in Table 0.1 which compares mean subscale scores of dentate and edentulous people who took part in a study of older adults in two South Australian cities.¹⁰ Edentulous persons had significantly higher scores for functional limitation and physical disability, although not for other subscales. It should be noted that higher scores for functional limitation, physical pain and physical disability can be expected for denture wearers because each of these subscales has one question that applies only to denture wearers. In this sample, 98 per cent of edentulous people wore dentures, compared with 55 per cent of dentate persons, which would account for some of the differences observed in Table 0.1.

Coefficients of variation (σ/μ) ranged from 0.63 to 2.46 for dentate people and 1.00 to 3.46 for edentulous (Table 0.1). In order to detect a difference of 25 per cent in mean scores for a subscale with a coefficient of variation of 1.0, some 251 persons per group would be required to achieve standard type I (0.05) and type II (0.20) errors.

Table 0.1: Mean OHIP scores among subgroups of South Australians aged 60+ years

Subscale	DENTATE (n=905)			EDENTULOUS (n=312)			P-value
	mean	sd*	cv [†]	mean	sd	cv	
Functional limitation	7.91	5.15	0.65	8.67	9.33	1.08	0.04
Physical pain	7.84	4.96	0.63	7.85	7.87	1.00	0.98
Psychological discomfort	5.94	6.38	1.07	5.36	11.30	2.11	0.20
Physical disability	3.60	4.33	1.20	5.58	8.26	1.48	0.01
Psychological disability	3.14	4.79	1.53	3.44	8.24	2.40	0.38
Social disability	1.23	3.03	2.46	1.59	5.50	3.46	0.09
Handicap	1.67	3.31	1.98	1.87	5.69	3.04	0.38

* sd=Standard deviation

† cv=coefficient of variation (sd/mean)

Findings from a longitudinal study of 67 elderly South Australians demonstrated general stability in OHIP scores.¹⁴ Subjects were asked to complete one questionnaire per month for a 12 month period. There was a small net increase in the number of items reported per month (baseline=2.10 items, 12-months=2.15, P=0.83). Response patterns for all 12 months revealed that only a small proportion (13.5 per cent) of people displayed an overall trend of increasing or decreasing impacts, although 47.8 per cent had a transient fluctuation of at least two items in at least one month.

In studies of independently living older adults, the self-completed questionnaire has been acceptable to respondents. Response rates for mail questionnaires with up to two reminder notices typically ranged from 71 to 86 per cent, although in a study involving elderly North Carolina blacks, where many survey participants had difficulty reading, the response rate was only 58 per cent.¹¹ While a majority of respondents completed all 49 questions satisfactorily, 43 per cent of respondents in the South Australian study of older adults had at least one blank entry or "don't know" response. In those instances, sample mean values for individual questions were imputed for missing or "don't know" responses when computing subscale scores, although any questionnaire with more than nine such responses was discarded. Some seven per cent of questionnaires were discarded for this reason in the South Australian study of older adults.

The number of missing items can be reduced with an interviewer-administered version of the OHIP, although a pilot study revealed other problems with that format, including interviewer burden

(average time for telephone or face-to-face administration was 17 minutes) and lower levels of test-retest reliability.¹⁵

The substantive findings from the OHIP come primarily from epidemiological studies which reveal:

- higher OHIP scores among people who have poorer clinical oral status, as indicated by more missing teeth, more retained root fragments, more untreated decay, deeper periodontal pockets and more periodontal recession^{11,13,16}
- higher OHIP scores among socially and economically disadvantaged groups, and among people who have infrequent or problem-motivated dental visits^{10,13,14,16}
- higher OHIP scores among dental patients with HIV infection compared with general dental patients¹⁷
- overall stability in OHIP scores for a majority of independently-living older adults during two-year follow-up periods¹⁸⁻²⁰
- increases in OHIP scores during a two-year period for dentate people who experienced tooth loss¹⁹ and decreases for edentulous people who received prosthodontic treatment,²¹ although the effects were conditional upon baseline oral status and perceptions of need

ALTERNATE FORMS

A shortened (14-item) version of the OHIP has been developed from analysis of South Australian data.²² Work is underway with French and Spanish forms of the OHIP, although this has revealed some questions and response categories that could not be satisfactorily translated.

DISCUSSION AND EVALUATION

Cross sectional studies that have used the OHIP in various populations reveal levels of dysfunction, discomfort and disability that appear consistent with clinical conditions and access to dental care in those populations. At this descriptive level, the results reveal some subtle differences in the seven conceptual dimensions of impact - for example, edentulous South Australians had higher levels of functional limitation and physical disability than dentate people, while other dimensions did not differ significantly (Table 0.1). However, there is also a high amount of correlation

among dimensions, so that statistical associations with impact appear fairly consistent using either subscales or summary scores.¹¹ This is consistent with the finding that all 49 items had high loadings on a single factor that accounted for 69 per cent of variation in a principal components factor analysis.²² This in turn suggests that, for descriptive purposes, a single-item global question about oral health related quality of life would capture many of the same associations that are observed with this more detailed OHIP questionnaire.

While these cross sectional findings suggest that the OHIP captures a single dimension of impact, it will be important to examine data from longitudinal studies and clinical trials in order to determine if the conceptual dimensions provide information about subtly different outcomes that are important from a clinical perspective. Other potential uses for the OHIP should be investigated, including its potential to identify groups with a high priority for dental care. Several sub-themes could be investigated: the ability of the OHIP to identify groups that place a high priority on their own treatment needs, or that place a high priority on oral health, or that place a high priority on outcomes of dental care that increase quality of life. In addition, there is scope for additional research to investigate how other aspects of quality of life interact with the dimensions captured in the OHIP. This research needs to take place within a broader agenda of clinical and health services research that examines the impact of dental care on people's well being from a range of perspectives that include clinical outcomes, satisfaction and quality of life.

REFERENCES

1. Tugwell P, Bennett KJ, Sackett D, et al. Relative risks, benefits and costs of intervention. In Warren KS, Mahmoud AAF (editors) *Tropical and geographic medicine*. New York: McGraw Hill; 1985; p. 1097-113.
2. Patrick DL, Bergner M. Measurement of health status in the 1990s. *Ann Rev Pub Health* 1990; 11:165-83.
3. Gilson BS, Gilson JS, Bergner M, Bobbitt RA, Kressel S, Pollard WE, Vesselago M. The sickness impact profile. Development of an outcome measure of health care. *Am J Pub Health* 1975; 65:1304-10.
4. Hunt SM, McEwan J, McKenna SP. *Measuring health status*. London: Croom Helm; 1986.
5. Slade GD, Spencer AJ. Development and evaluation of the oral health impact profile. *Community Dental Health* 1994; 11:3-11.
6. Locker D. Measuring oral health: a conceptual framework. *Community Dental Health* 1988; 5:5-13.

7. World Health Organization. International classification of impairments disabilities and handicaps: a manual of classification. Geneva: World Health Organization; 1980.
8. Edwards AL. Techniques of attitude scale construction. New York: Appleton-Century-Crafes Inc. 1957.
9. Jokovic A, Allison P, Locker D, Slade GD. A cross-cultural comparison of oral health values. *J Dent Res* 1997; 76(IADR Abstracts):207. Abstract 1546.
10. Slade GD, Spencer AJ. Social impact of oral disease among older adults. *Aust Dent J* 1994; 39:358-64.
11. Slade GD, Spencer AJ, Locker D, Hunt RJ, Strauss RP, Beck JD. Variations in the social impact of oral conditions among older adults in South Australia, Ontario and North Carolina. *J Dent Res* 1996; 75:1439-50.
12. Locker D, Slade GD. Oral Health and the quality of life among older adults: The Oral Health Impact Profile. *Can Dent J* 1993; 59:830-44.
13. Locker D, Slade G. Association between clinical and subjective indicators of oral health status in an older adult population. *Gerodontology* 1994; 11:108-14.
14. Slade GD, Hoskin GW, Spencer AJ. Trends and fluctuations in the impact of oral conditions among older adults during a one year period. *Community Dent Oral Epidemiol* 1996; 24:317-21.
15. Slade GD, Spencer AJ, Keily P. Effects of data collection methods on self-reported oral health impact. *J Dent Res* 1992; 71(4):978. Abstract 15.
16. Hunt RJ, Slade GD, Strauss R. Racial variations in social impact among older community-dwelling adults. *J Public Health Dent* 1995; 55:205-9.
17. Coates E, Slade GD, Goss AN, Gorkic E. Oral conditions and their social impact among HIV dental patients. *Aust Dent J* 1996; 41:33-6.
18. Hunt RJ, Slade GD. Changes in oral impact over two years in North Carolina elderly. *J Dent Res* 1995; 74(AADR Abstracts):168. Abstract 1255.
19. Slade GD, Spencer AJ. Tooth-loss incidence and its social impact among older South Australians. *J Dent Res* 74(IADR Abstracts) 1995; 520. Abstract 956.
20. Slade GD, Locker D. Patterns of change in impact of oral disorders among seniors. *J Dent Res* 1993; 72(4):265. Abstract 1294
21. Slade GD, Spencer AJ. Dentures and oral health impact among elderly edentulous South Australians. *J Dent Res* 1996; 75 (IADR Abstracts):240. Abstract 1780.
22. Slade GD. Derivation and validation of a short-form oral health impact profile. [In press] *Community Dent Oral Epidemiol*.

Table 0.2: Questions and weights for the Oral Health Impact Profile

Dimension*	Weight	Question†
FL	1.253	1. Have you had difficulty chewing any foods because of problems with your teeth, mouth or dentures?
FL	1.036	2. Have you had trouble pronouncing any words because of problems with your teeth, mouth or dentures?
FL	0.747	3. Have you noticed a tooth which doesn't look right?
FL	1.059	4. Have you felt that your appearance has been affected because of problems with your teeth, mouth or dentures?
FL	1.154	5. Have you felt that your breath has been stale because of problems with your teeth, mouth or dentures?
FL	0.931	6. Have you felt that your sense of taste has worsened because of problems with your teeth, mouth or dentures?
FL	1.181	7. Have you had food catching in your teeth or dentures?
FL	1.168	8. Have you felt that your digestion has worsened because of problems with your teeth, mouth or dentures?
P1	1.213	9. Have you had painful aching in your mouth?
P1	0.937	10. Have you had a sore jaw?
P1	1.084	11. Have you had headaches because of problems with your teeth, mouth or dentures?
P1	1.053	12. Have you had sensitive teeth, for example, due to hot or cold foods or drinks?
P1	1.361	13. Have you had toothache?
P1	1.088	14. Have you had painful gums?
P1	0.998	15. Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth or dentures?
P1	1.264	16. Have you had sore spots in your mouth?
FL	1.472	17. Have you felt that your dentures have not been fitting properly?
P1	1.002	18. Have you had uncomfortable dentures?
P2	2.006	19. Have you been worried by dental problems?
P2	1.902	20. Have you been self conscious because of your teeth, mouth or dentures?
P2	2.252	21. Have dental problems made you miserable?
P2	1.815	22. Have you felt uncomfortable about the appearance of your teeth, mouth or dentures?
P2	2.025	23. Have you felt tense because of problems with your teeth, mouth or dentures?

Continued

Table 0.2 continued

Dimen- sion*	Weight	Question†
D1	1.109	24. Has your speech been unclear because of problems with your teeth, mouth or dentures?
D1	1.111	25. Have people misunderstood some of your words because of problems with your teeth, mouth or dentures?
D1	1.051	26. Have you felt that there has been less flavor in your food because of problems with your teeth, mouth or dentures?
D1	1.068	27. Have you been unable to brush your teeth properly because of problems with your teeth, mouth or dentures?
D1	1.266	28. Have you had to avoid eating some foods because of problems with your teeth, mouth or dentures?
D1	1.022	29. Has your diet been unsatisfactory because of problems with your teeth, mouth or dentures?
D1	1.351	30. Have you been unable to eat with your dentures because of problems with them?
D1	1.070	31. Have you avoided smiling because of problems with your teeth, mouth or dentures?
D1	0.952	32. Have you had to interrupt meals because of problems with your teeth, mouth or dentures?
D2	1.950	33. Has your sleep been interrupted because of problems with your teeth, mouth or dentures?
D2	1.393	34. Have you been upset because of problems with your teeth, mouth or dentures?
D2	1.646	35. Have you found it difficult to relax because of problems with your teeth, mouth or dentures?
D2	1.936	36. Have you felt depressed because of problems with your teeth, mouth or dentures?
D2	1.638	37. Has your concentration been affected because of problems with your teeth, mouth or dentures?
D2	1.437	38. Have you been a bit embarrassed because of problems with your teeth, mouth or dentures?
D3	1.572	39. Have you avoided going out because of problems with your teeth, mouth or dentures?
D3	2.555	40. Have you been less tolerant of your partner or family because of problems with your teeth, mouth or dentures?
D3	1.832	41. Have you had trouble getting along with other people because of problems with your teeth, mouth or dentures?
D3	2.236	42. Have you been a bit irritable with other people because of problems with your teeth, mouth or dentures?
D3	1.805	43. Have you had difficulty doing your usual jobs because of problems with your teeth, mouth or dentures?

Continued

Table 0.2 continued

Dimension*	Weight	Question†
H	2.112	44. Have you felt that your general health has worsened because of problems with your teeth, mouth or dentures?
H	1.420	45. Have you suffered any financial loss because of problems with your teeth, mouth or dentures?
H	1.545	46. Have you been unable to enjoy other people's company as much because of problems with your teeth, mouth or dentures?
H	1.567	47. Have you felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?
H	1.879	48. Have you been totally unable to function because of problems with your teeth, mouth or dentures?
H	1.476	49. Have you been unable to work to your full capacity because of problems with your teeth, mouth or dentures?

* FL=Functional limitation, P1=Physical pain, P2=Psychological discomfort, D1=Physical disability, D2=Psychological disability, D3=Social disability, H=Handicap

† Response categories for all questions are: "Very often", "Fairly often", "Occasionally", "Hardly ever" and "Never". "Don't know" can also be included as a response category. For questions 17, 18 and 30 a "not applicable" response is provided to indicate if dentures are not worn. Instructions to respondents should also indicate the desired time period (e.g., during the last 12 months, during the last month, etc.).