Dentists' selection of measures for assessment of oral health risk factors for Finnish young adults

Sari E. Helminen, Miira Vehkalahti, Taina-Mari Ketomäki and Heikki Murtomaa

Department of Oral Public Health, Institute of Dentistry, University of Helsinki, Finland;
Department of Health and Social Welfare, City of Vantaa, Finland

Helminen SE, Vehkalahti M, Ketomäki T-M, Murtomaa H. Dentists' selection of measures for assessment of oral health risk factors for Finnish young adults. Acta Odontol Scand 1999;57:225–230. Oslo. ISSN 0001-6357.

Dentists' selection of measures for assessing oral health risk factors for young adults, in relation to their oral health status and to those dentists' characteristics, was studied in one administrative unit of the Finnish public oral health service. A random selection ($n = 239$) was made of all young adults born in the period 1966–71 and clinically examined during 1994. On the original oral health records of those selected, all notes were scrutinized concerning the most recent clinical examination and treatment course; in total 208 (87%) records. We found that assessment of risk factors to oral health was rare. The patient's diet had been recorded as assessed in 7% of all cases, use of fluoride in 8%, and oral hygiene habits in 14%. No salivary tests were performed; nor was patients' use of tobacco assessed. No correlation was detected between measures used by these dentists and their patients' oral health status (DMFT and DT scores, number of approximal incipient lesions, and number of healthy sextants by CPITN). The oral health status impelled only slightly assessments by bite-wing radiographs. Fewer than half (44%) of the dentists performed and recorded any kind of assessment measure; 4% assessed diet, hygiene, and use of fluoride for all their patients in our sample. A dentist's gender showed no correlation with number of measures used; younger dentists tended to perform and record assessments slightly more often than did older dentists, but in all age groups there were those who had not done this. The practice of risk-factor assessment should be more widespread and standardized, contributing to needs-based treatment and allocation of resources. □ *Health service research; public oral health care; treatment decisions*

Sari E. Helminen, Department of Oral Public Health, Institute of Dentistry, University of Helsinki, PO Box 41, FIN-00014 Helsinki, Finland. E-mail: sari.helminen@helsinki.fi

Though the average DMFS numbers in adolescent populations have decreased during the past few decades, caries is still the most common oral disease and seems to concentrate in a minority of high-risk individuals (1–3). In addition to risk factors such as diet, oral hygiene habits, salivary factors, and use of fluoride, increased knowledge about tobacco-use contributes to the need to assess each patient's individual risks to oral health (4–7). Regular reassessments are needed to detect any changes in potentially unstable determinants of oral health (8–11).

The multifactorial nature of oral health risks calls for multiple identification and assessment procedures (11, 12), but practical limitations restrict dentists' everyday selection of measures across the entire range of diagnostic possibility, focusing the decision-making within the most achievable alternatives (13). Limited resources obligate dentists to target risk-assessment measures according to patients' suspected oral health risk, based on observed risk indicators (10, 11). Feasible measures for assessing oral health risks include information obtained by patient interview and clinical examination, completed with radiographs and salivary tests for those needing these. No measure alone is sufficient for assessing oral health risks and predicting future development, but a combination of measures as used in a routine clinical examination and assessed by a dentist has been shown to be a reasonable tool (14–18).

Variation in dentists' clinical decisions is wide, ubiquitous, and acknowledged (19–21). This variation results from complex interaction of numerous factors in characteristics of dentist, patient, as well as of operating environment. Though different decisions may lead to similar quality of care, the equal appropriateness of resultant care delivered at both outermost ends of the variability is dubious (19–21). The least variation in provided care seems to appear among examinations and preventive procedures, although prevention could expectantly be based on assessed individual risk (20, 21).

Assessment of risk factors for each patient contributes to needs-based preventive care and to reasoned treatment designs, and allows for individual check-up intervals, thus allowing for a rational allocation of resources. Consequently, individual risk assessment is considered as a means for improving the quality of oral health care (22, 23).

The aim of this study was to evaluate dentists' real-life selection of measures for assessing oral health risk factors for young adults, in relation to their oral health status, and to those dentists' characteristics.

Material and methods

Background

We carried out the present study in cooperation with the Public Oral Health Service in Vantaa, a town of

Table 1. Patient characteristics at clinical examination

	Male (n = 71) Mean (SD)	Female (n = 137) Mean (SD)	Total (n = 208) Mean (SD)
Age (years) at clinical examination	26.4 (2.2)	26.7 (1.9)	26.6 (2.0)
No. of DMF-teeth	11.5 (4.9)	12.2 (5.4)	11.9 (5.2)
No. of D-teeth	2.1 (2.5)	1.7 (2.5)	1.8 (2.5)
No. of approximal incipient lesions	2.1 (2.6)	2.3 (2.5)	2.2 (2.5)
No. of healthy sextants by CPITN	1.6 (2.0)	2.5 (2.2)	2.2 (2.2)

Statistical evaluation by t-test. Difference by gender: NS.

165,000 inhabitants in southern Finland. In 1995, 65% of the population were, based on age, entitled to public oral health services. In Finland, these services are available, free of charge and on a regular basis, for all below age 19. For adults born after 1955 the basic services are more subsidized in the municipal dental clinics than in private offices. The effect of subsidization on young adults' choice of sector (public or private dental care) has, however, been marginal (24). In 1995, in the 37 public dental clinics of Vantaa, patients under 19 made 63% of the visits, the age group 19–39 made 32%, and those older than 39 the rest.

Gathering of data

The basic population comprised all patients (n = 3,248) born in the period 1966–71 and clinically examined in 1994. A random computerized selection of 239 patients included 4–5 cases per dentist to represent an everyday selection of measures for assessing oral health risks in the public oral health service. Data on actual clinical examinations and treatment courses carried out in the public dental clinics came from original individual oral health records requested from the clinics. All notes concerning the most recent clinical examination and treatment course, including the number of radiological bite-wing examinations from the 3 years preceding the completion of the treatment course, were scrutinized. Eligible recordings on clinical examination and treatment course performed from 1994 to 1996 were available for 208 cases (87% of the sample). One of the authors (SEH) reviewed and collected the data between November 1996 and May 1997 in accordance with a written, pre-tested protocol.

Personal oral health records should include organized information on patient history and oral health status, on assessment of patient's diet, use of fluoride, and oral hygiene habits and a detailed description of measures performed during the treatment course, as commonly suggested (25, 26) and required by Finnish health legislation and instructions given by the Ministry of Welfare and Health, by the National Board of Health (27), and by the local authorities (28, 29).

Oral health status

Oral health status was described by numbers of decayed-missing-filled teeth (DMFT) and decayed teeth (DT), numbers of approximal incipient lesions (Appr.C_I), numbers of approximal decayed-filled surfaces (Appr.DFS), and also by the community periodontal index for treatment need (CPITN), as counted from the detailed notes made on oral health records. Characteristics of the study population are presented in Table 1.

Measures for assessing oral health risk factors

Recordings on a patient's diet, oral hygiene habits, and use of fluoride, as well as use of tobacco, number of bite-wing (BW) radiographs cumulative for the 3 years preceding, and saliva tests performed illustrated the selection of measures for assessing oral health risk factors.

Dentists

Authorities in the Vantaa Oral Health Service provided the background data on the dentists, by their codes, including month and year of birth, gender, and year of graduation. Of the 50 full-time working dentists, 14% were male, performing 17% of the clinical examinations. Dentists' ages, defined separately at the time of each clinical examination, ranged from 30.3 to 62.3 years (mean 43.0; SD 7.5; median 40.6).

Evaluation of measures for assessing oral health risk factors in relation to oral health status

Dentists' selection of measures for assessing oral health risk factors was evaluated in relation to each patient's oral health status. A variety of measures was expected to have been applied for those susceptible to oral health risk factors, based on their current oral health status as risk indicator. Patients were judged as highly susceptible to risk factors on account of their DMFT exceeding 15, DT and Appr.C_I exceeding 2, and to all sextants being in need for treatment by CPITN. Low susceptibility was defined by DMFT below 7, DT and Appr.C_I being 0, and no sextant in need of treatment (8, 10, op. cit.).

A cluster of recordings on diet, hygiene, and fluoride was formed to describe the frequency of risk-factor assessment, being considered positive in the case any of these 3 having been recorded.

Table 2. Frequency of risk-factor and radiological (bite-wing) assessments by oral health indicators in young adults

Oral health indicator	*n*	≥1 risk-factors* assessed (%)	*P*-value	≥1 radiological assessments (%)	*P*-value
No. of decayed teeth					
0	84	16.7		17.9	
1–2	67	16.4	0.890	26.9	0.059
≥3	57	15.8		31.6	
No. of DMF-teeth					
≤6	32	15.6		18.8	
7–15	126	15.9	0.780	20.6	0.065
≥16	50	18.0		38.0	
No. of approximal incipient lesions					
0	66	10.6		16.7	
1–2	68	20.6	0.190	29.4	0.098
≥3	70	18.6		28.6	
No. of healthy sextants by CPITN					
6	21	23.8		23.8	
1–5	110	20.9	0.077	29.1	0.462
0	66	9.1		16.7	

Statistical evaluation between groups with low and high susceptibility to oral health risk factors by the chi square test.
*Risk factors: patient diet, use of fluoride, and oral hygiene habits.

Statistical evaluation

Statistical significance of differences between groups was evaluated by means of the *t*-test and by the chi square test. The chi square test was applied to compare the differences between the high and low susceptibility groups based on DMFT, DT, CPITN, and Appr.C_I. Associations between variables were demonstrated by the use of the (Pearson) correlation coefficient. A logistic regression model was fitted to evaluate factors related to realized assessments, separately for oral health risk factors and for radiological assessment by bite-wings.

Results

The patient's diet was recorded as assessed in 7% of all cases, use of fluoride in 8%, and oral hygiene habits in 14%. No salivary tests had been performed; nor had patients' use of tobacco been assessed. No statistically significant differences were detected between measures used by these dentists based on their patients' oral health status (DMFT, DT, and Appr.C_I scores), with periodontal status being an exception (Table 2): possible risk factors had been assessed more frequently for those in no need of periodontal treatment than for those in need of treatment in all sextants.

An examination using BW radiographs had been done for 25% of the cases, while 68% of the subjects had approximal incipient caries lesions and only 9% were totally free of decayed or filled approximal surfaces. Patients with higher DMFT, DT, and Appr.C_I scores had been examined more frequently by BW radiographs than those with lower or zero scores (Table 2). Periodontal status made no significant difference to the frequency of BW examinations.

Fewer than half (44%) of the dentists had performed and mapped any kind of assessment measures; 20% had used 2 or more measures for individual patients, whereas 4% had assessed diet, hygiene, and use of fluoride for all their patients in our sample. A dentist's age correlated slightly with number of measures used (Fig. 1), but gender showed no correlation.

Logistic regression models with patient DT, Appr.C_I, and Appr.DFS scores, and with dentist gender and year of graduation as explanatory variables were separately fitted for assessment of oral health risk factors and for radiological assessment (bite-wings). In this model the odds ratio for risk-factors to be assessed was 1.09 when comparing later graduated dentists to earlier graduated dentists ($P = 0.014$). The odds ratio for radiological assessment was 1.04, patients with more decayed-filled approximal surfaces receiving more often bite-wings

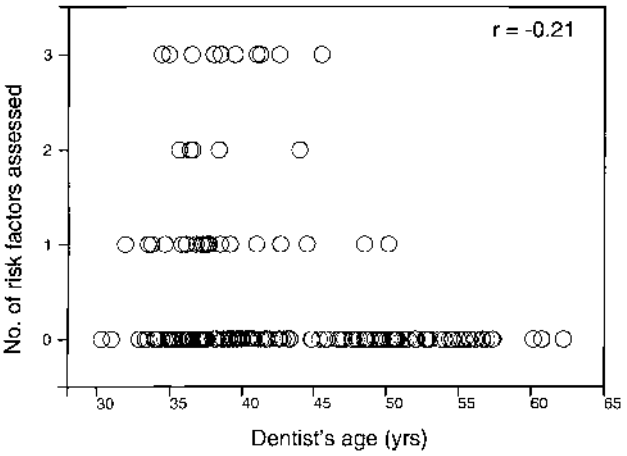

Fig. 1. No. of assessed risk factors in relation to dentist's age. Each circle illustrates one patient.

Table 3. Logistic regression models separately fitted for oral health risk factor and radiological (bite-wing) assessments in young adults. (N = 204)

	≥1 risk-factors* assessed					≥1 radiological assessments				
Parameters	Estimate	SE	*P*-value	OR	95% CI	Estimate	SE	*P*-value	OR	95% CI
No. of decayed teeth	0.05	0.08	0.497	1.05	0.9–1.2	0.04	0.07	0.540	1.04	0.9–1.2
No. of approximal incipient lesions	0.06	0.08	0.447	1.06	0.9–1.2	0.09	0.06	0.164	1.09	1.0–1.2
No. of approximal decayed-filled surfaces	−0.02	0.03	0.357	0.98	0.9–1.0	0.04	0.02	0.035	1.04	1.0–1.1
Dentist gender	0.54	0.66	0.412	1.71	0.5–6.1	0.76	0.53	0.150	2.13	0.8–6.0
Dentist year of graduation	0.09	0.04	0.014	1.09	1.0–1.2	−0.03	0.02	0.242	0.97	0.9–1.0

SE = Standard error, OR = Odds ratio, 95% CI = 95% confidence interval.
*Risk factors: patient diet, use of fluoride, and oral hygiene habits.

($P = 0.035$). In both models all other parameters remained non-significant. Table 3 summarizes these analyses.

Discussion

Dentists' selection of measures for assessment of oral health risk factors was found to be limited; only diet, oral hygiene, and use of fluoride were assessed for some cases, although such an assessment is commonly recommended for each patient as part of needs-related care (22, 23, 27–29). This paucity of assessments might be due to dentists not recording all the measures they performed and this could also be the case with tobacco-use assessments, which can take the form of informative conversation, but not with saliva tests requiring clinical action. Although these dentists' record-keeping practices have been found to vary from one dentist to the next (30), it can be presumed that those who tended to record assessed risk factors would have done so independently of a patient's oral health status. In general, the frequency of recorded risk-factor assessments was scarcely at all directed by patients' oral health status, which the same dentists had recorded in detail, thus obviously being aware of it.

The need for assessing (oral) health services has been widely acknowledged as a basis for improvement of services (31–33). This has traditionally followed Donabedian's structure-process-outcome model (34). Due to the cyclic nature of the oral healthcare process (26, 35), the outcome of the previous treatment decision and intervention, based on a clinical examination and risk assessment, serves in turn as a basis for the following clinical examination and risk-factor assessment. Our cross-sectional data capture a condition of this process at a moment in time. In a real-life oral health check-up, a dentist does not necessarily have information on interventions each patient has formerly received. Even if a dentist had this information, an assessment allows him/her to update the situation in regard to oral health risk factors. The moment when a patient's oral health status as an indicator of former susceptibility to oral health risk factors is examined and current risk factors are assessed is crucial to the success of the entire process of oral health treatment.

Our data were collected from the original oral health records of a randomly selected sample and the recordings had been made during actual treatment courses. Furthermore, the sample was confined to a narrow age group, homogeneous in respect to the type of oral health problems but large enough to give variation in the severity of problems. The dentists had been treating these patients as a part of their daily routine, and were at those times unaware of the present study; therefore, the data can be considered representative of real-life risk-factor assessment practices.

Reflecting knowledge that the caries progression rate through the enamel may be quite slow (26) and that the tooth surfaces inaccessible to other evaluation methods and the depth of a lesion can be evaluated on BW radiographs, allowing estimation of the speed of lesion progression from serial BWs (37), the frequency of radiological BW examinations was very low. Although BWs are recommended to be taken at 24- to 36-month intervals even though a patient showed no indicators for caries risk factors (38, 39), the decision to use diagnostic radiography requires the meticulous professional judgment of dentists (38–43).

In our analysis there is only a borderline significance, but the tendency is clear (Table 2) that the higher the DMFT, Appr.C_I and DT scores the more likely the decision is made that a radiograph should be taken. However, the recordings of DMFT, Appr.C_I and DT may partly be based on assessment of radiographs. If so, nevertheless, it shows that in those cases a dentist's 'gut feel' has compelled to assess further.

A previous study on Finnish dentists showed that female dentists in the public oral health service reported applying caries-risk assessment more frequently for patients than did their male colleagues (44). Our findings differ, with dentist's gender showing no correlation with risk-factor assessment practice. Moreover, a patient's oral health status did not determine the rate of assessed risk factors, assuming some other driving forces. As found in previous studies, some dentists are indeed more prevention-oriented than the rest, and, on the other hand, a practice pattern, once established, tends to remain (45, 46).

It can be argued that older colleagues, after years of clinical practice, can use their 'gut feel' rather than risk-factor assessment as a basis for treatment decisions (18).

Unfortunately, however, this practice does not communicate the result of gathering the relevant information and the conclusions arrived at. In our study, there were dentists in all age groups who did not record any measures taken for risk-factor assessment. This reflects an obvious attitude towards the importance of assessment of a patient's oral health risks as a part of comprehensive oral healthcare.

Assessment of individual oral health risk factors should be an integrated part of each clinical examination and treatment course, contributing to diagnosis and to decisions about preventive and restorative treatment, and to personal check-up intervals. Thus, such assessment correspondingly is a prerequisite for reasoned allocation of limited resources. Further, it is the task of a dentist not only to diagnose high-risk individuals, but to give all patients a message about their own possibility to maintain oral health, allowing them to make informed decisions.

As the oral health risk-assessment practice was only partially explained by dentists' characteristics, attempts to change dentists' behavior should be aimed at dentists across the board. Education should enable scientific knowledge to be transferred to the patterns of everyday practice. In order to calibrate risk-assessment practices, the professional community should agree upon a standard of risk assessment and take part in follow-up of compliance with it.

References

1. Bowen WH. Dental caries: Is it an extinct disease? JADA 1991;122:49–52.
2. Downer MC. Caries prevalence in the United Kingdom. Int Dent J 1994;44:365–70.
3. Vehkalahti M, Tarkkonen L, Varsio S, Heikkilä P. Decrease in and polarization of dental caries occurrence among child and youth populations, 1976–1993. Caries Res 1997;31:161–5.
4. Axell T, Holmstrup P, Kramer I, Pindborg J, Shear M. International seminar on oral leukoplakia and associated lesions related to tobacco habits. Community Dent Oral Epidemiol 1984;12:145–54.
5. Little S, Stevens V, LaChance P, Sevenson H, et al. Smokeless tobacco habits and oral mucosal lesions in dental patients. J Publ Health Dent 1992;52:269–76.
6. Ahlberg J, Tuominen R, Murtomaa H. Oral mucosal changes and associated factors among male industrial workers with and without access to subsidized dental care. Acta Odontol Scand 1996;54:217–22.
7. Axelsson P, Paulander J, Lindhe J. Relationship between smoking and dental status in 35-, 65-, and 75-year-old individuals. J Clin Periodontol 1998;25:297–305.
8. Blinkhorn AS, Geddes DAM. Assessment of caries risk and the potential for preventive management. In Elderton RJ, editor. Positive dental prevention, the prevention in childhood of dental disease in adult life. London: Heinemann Medical Books; 1987. p. 20–8.
9. DePaola PF. Measurement issues in the epidemiology of dental caries. In: Bader JD, editor. Risk assessment in dentistry. Chapel Hill: University of North Carolina Dental Ecology; 1990. p. 19–26.
10. Bratthall D, Ericsson D. Tests for assessment of caries risk. In: Thylstrup A, Fejerskov O, editors. Textbook of clinical cariology, 2nd ed. Copenhagen: Munksgaard; 1994. p. 333–54.
11. Beck JD. Identification of risk factors. In: Bader JD, editor. Risk assessment in dentistry. Chapel Hill: University of North Carolina Dental Ecology, 1990. p. 8–13.
12. Cheney HG, DePaola DP, Glinka MP. Examination, diagnosis, and treatment planning in a preventive practice. In: Gardner AF, editor. Preventive dentistry postgraduate dental handbook series. Littleton, MA: PSG Publishing, 1979;2:39–54.
13. Katz RV. Reactor paper: measurement issues in the epidemiology of dental caries. In: Bader JD, editor. Risk assessment in dentistry. Chapel Hill: University of North Carolina Dental Ecology, 1990. p. 27.
14. Binnie WH. Risk factors and risk markers for oral cancer in low incidence areas of the world. In: Johnson NW, editor. Risk markers for oral diseases. Cambridge: Cambridge University Press; 1991;3:64–87.
15. Lang NP. Clinical markers of active periodontal disease. In: Johnson NW, editor. Risk markers for oral diseases. Cambridge: Cambridge University Press; 1991;3:179–202.
16. Disney JA, Graves RC, Stamm JW, Bohannan HM, Abernathy JR, Zack DD. The University of North Carolina caries risk assessment study: further developments in caries risk prediction. Community Dent Oral Epidemiol 1992;20:64–75.
17. Hausen H, Seppä L, Fejerskov O. Can caries be predicted? In: Thylstrup A, Fejerskov O, editors. Textbook of clinical cariology, 2nd ed. Copenhagen: Munksgaard; 1994. p. 393–411.
18. Alanen P, Hurskainen K, Isokangas P, Pietilä I, Levänen J, Saarni U-M, Tiekso J. Clinician's ability to identify caries risk subjects. Community Dent Oral Epidemiol 1994;22:86–9.
19. Anusavice KJ. Decision analysis in restorative dentistry. J Dent Educ 1992;56:812–22.
20. Bader JD, Shugars DA. Variation, treatment outcomes, and practice guidelines in dental practice. J Dent Educ 1995;59:61–95.
21. Bader JD, Shugars DA. Variation in dentists' clinical decisions. J Public Health Dent 1995;55:181–8.
22. Stamm JW, Stewart PW, Bohannan HM, Disney JA, Graves RC, Abernathy JR. Risk assessment for oral diseases. Adv Dent Res 1991;5:4–17.
23. Powell LV. Caries risk assessment: relevance to the practitioner. JADA 1998;129:349–53.
24. Arinen S-S, Sintonen A. Choice of dental care sector by young adults after subsidization reform [English summary]. J Soc Med 1990;27:143–54.
25. Bailit H, Gotowka T. Guidelines for the development of a quality assurance system for hospital dental programs. Am Dent Assoc 1983.
26. Jerge CR, Orlowski RM. Quality assurance and the dental record. Dent Clin North Am 1985;29:483–96.
27. National Board of Health. Instructions for the systematic dental care to the population born in 1961 or later. Directive 6/85. Helsinki 1985.
28. Vantaa City Health and Social Welfare Department (1991) Instructions for patient documentation. (Circular.)
29. Vantaa City Health and Social Welfare Department (1993) Instructions for individual treatment schemes. (Circular.)
30. Helminen SE, Vehkalahti M, Murtomaa H, Kekki P, Ketomäki T-M. Quality evaluation of oral health record-keeping for Finnish young adults. Acta Odontol Scand 1998;56:288–92.
31. Schoen MH. Quality of dental care. Curr Opin Dent 1991;1: 322–8.
32. Maas WR, Garcia AI. Health services research, the agency for health care policy and research, and dental practices. J Am Coll Dent 1994;61:18–24.
33. Øvretveit J. Health service quality. An introduction to quality methods for health services. Cambridge: Blackwell Science; 1992. p. 61–75.
34. Donabedian A. Evaluating the quality of medical care. Milbank Mem Fund Q 1966;44 Part 2:166–203.
35. Marrshall KF. Evaluating quality through records and radiographs—a rationale for general dental practice. Br Dent J 1995; 179:234–5.

36. Shwartz M, Gröndahl H-G, Pliskin JS, Boffa J. A longitudinal analysis from bite-wing radiographs of the rate of progression of approximal carious lesions through human dental enamel. Arch Oral Biol 1984;29:529–36.
37. Gröndahl H-J. Radiological diagnosis in caries management. In: Thylstrup A, Fejerskov O, editors. Textbook of clinical cariology, 2nd ed. Copenhagen: Munksgaard; 1994. p. 367–82.
38. Council on dental materials instruments, and equipment. Recommendations in radiographic practices: an update, 1988. JADA 1989;118:115–7.
39. Pitts NB, Kidd EAM. The prescription and timing of bitewing radiography in the management of dental caries. Br Dent J 1992;172:225–7.
40. Stephens RG, Kogon SL, Wainright RJ, Reid JA. Information yield from routine bitewing radiographs for young adults. J Can Dent Assoc 1981;4:248–52.
41. Smith NJB. Risk assessment: the philosophy underlying radiation protection. Int Dent J 1987;37:43–51.
42. Pitts NB, Kidd EAM. Some of the factors to be considered in the prescription and timing of bitewing radiography in the diagnosis and management of dental caries. J Dent 1992;20:74–84.
43. Horner K. Review article: radiation protection in dental radiology. Br J Radiol 1994;67:1041–9.
44. Kärkkäinen S. Caries prevention in Finland in the early 1990s [Thesis]. Acta Universitatis Ouluensis, D434, Oulu, 1997. English abstract and summary.
45. Grembowski D, Milgrom P, Fiset L. Variation in dentist service rates in a homogenous patient population. J Public Health Dent 1990;50:235–43.
46. Bailit H, Clive J. The development of dental practice profiles. Med Care 1981;19:30–46.

Received for publication 21 December 1998
Accepted 28 June 1999