Willingness to Pay for Periodontal Therapy: Development and Testing of an Instrument

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Abstract

Objectives: The objective of this study was to develop and test the feasibility and validity of a willingness to pay (WTP) tool in a dental setting. Methods: A questionnaire measured individuals' preferences among alternative treatments for periodontal disease and the maximum they would be willing to pay for their treatment of choice in terms of dental insurance premiums. The questionnaire provides detailed information, in probabilistic terms, of the risks and benefits of treatment choices for moderate to advanced adult periodontitis. It was pilot tested on 23 periodontal patients and 18 dental school faculty and staff. Results: The majority (92.6%) felt the questionnaire was an accurate representation of treatments and outcomes, establishing face and content validity. In terms of construct validity, four hypotheses were tested: (1) manipulation of the outcomes of the preferred treatment led to a predictable shift in preferences for 38 subjects (92.7%); (2) although periodontal patients were not more likely to choose periodontal surgery than nonpatients (P=.14), those with a history of surgery were more likely to choose surgery again (P=.06); (3) WTP was positively related to income level (P=.05); and (4) subjects were willing to pay more for coverage for themselves than for others. Periodontal surgery was the preferred treatment for moderate to advanced periodontal disease, and was more strongly preferred than other choices (i.e., a higher WTP) for all income groups. The intraclass correlation coefficient for treatment preferences was 0.95 (P<.001) and the kappa for WTP was 0.78 (P<.001). Conclusion: This pilot study supports some of the criteria concerning validity of the WTP questionnaire to measure preferences for alternative periodontal therapies. Further testing on larger samples is required to confirm these results. [J Public Health Dent 1999;59(1):44-51]

Key Words: preference-based measurements, periodontal therapy, willingness to pay, cost-benefit analysis, dental insurance, clinical decision making, health-related quality of life, economic analysis.

From the standpoint of the patient as well as others in the health care system, decisions about dental health care can be complex and overwhelming, . For example, in the treatment of moderate to advanced adult periodontal disease, controversy exists as to whether surgical or nonsurgical therapy is best. The "best" alternative depends upon the viewpoint of the decision maker. Clinicians may feel surgical therapy is the most efficacious in terms of long-term pocket depth reduction and attachment level gain (1). Patients, however, are more likely to be concerned about the effects of the two therapies on their quality of life.

While periodontal disease affects 15–30 percent of the population, periodontal services account for only 5 percent of the expenditures of many dental insurance plans (2). This discrepancy is due primarily to the fact that these plans remain unchanged from their original design of the 1960s. Their primary focus is the treatment of decayed or missing teeth rather than the preservation of oral health. Because of cost-containment barriers placed on the majority of dental plans,

many patients have inadequate or no insurance coverage for periodontal services. Consequently, they may not get the treatment they need, leading to patients taking more time off work either to manage acute periodontal problems or to replace teeth lost as a result of untreated periodontal disease. Although this paper examines the question from an insurance perspective, the same problems likely would arise in a tax-funded system such as the Veterans Affairs program, when decisions are made to reallocate health care dollars from one service to another (3). Where resources are limited, it would be useful to have a measure of the value of the benefits of dental care to the consumer to set priorities for dental health care expenditures.

One way to measure the value of the outcomes of a particular program or service is to determine consumers' willingness to pay (WTP) for the outcomes. The WTP technique is used in cost-benefit analysis, where health care services competing for limited resources are compared by valuing the costs as well as the benefits of the services or treatments in common units, usually monetary ones. This approach allows the calculation of net benefit of a health care service (i.e., benefit minus cost) in dollars.

While cost-benefit analysis is gaining appeal as a tool to compare competing health care programs, Quality Adjusted Life Years (QALYs) and the dental equivalent, Quality Adjusted Tooth Years, have been used more widely (3). The time trade-off and standard gamble approaches used to determine QALYs involve sacrificing years of life (or tooth life) when valuing improvements in quality of life. The WTP method also measures im-

Send correspondence and reprint requests to Dr. Matthews, Division of Periodontics, Dalhousie University, Halifax, Nova Scotia B3H 3J5 Canada. E-mail: debora.matthews@dal.ca. Drs. Birch and Gafni are affiliated with the Department of Clinical Epidemiology and Biostatistics, and Dr. DiCenso is with the School of Nursing, all at McMaster University, Hamilton, Ontario. Dr. DiCenso is a career scientist with the Ontario Ministry of Health. This paper was presented at the 1998 IADR annual meeting in Nice, France. Manuscript received: 4/21/98; returned to authors for revision: 8/17/98; accepted for publication: 12/16/98. provements in quality of life, albeit in monetary terms. A disadvantage of QALYs is that they measure the value of health gains only, while the WTP approach takes into account the process of care. Whereas individuals' preferences often are measured in the derivation of QALYs, the individual's valuation of QALYs rarely is assessed (4). The decision of whether a program producing a particular level of QALY is worth the costs is left to be determined by the values of the decision maker, with no attempt made to assess the values of individuals. The WTP approach incorporates individuals' assessment of the worth of the health outcomes. In addition, WTP is believed to be more sensitive to small changes in health states (5,6), as may be the case for dental outcomes. The willingness to pay (WTP) approach has been used in assessing alternatives such as arthritis management (7), in vitro fertilization (8), and antidepressant medications (9); however, its use in a dental setting has not been reported to date.

The objective of this study was to develop a WTP questionnaire designed to measure individuals' preferences among alternative treatments for moderate to advanced adult periodontal disease and the maximum they would be willing to pay for their treatment of choice in terms of dental insurance premiums. We then wanted to test the feasibility and validity of such an instrument in a dental setting. The decision problem for this questionnaire was framed in such a way as to recognize that an individual's future dental health needs are uncertain. Because most individuals are familiar with the concept of dental insurance, we felt that framing the question in an insurance-based format was appropriate. Thus, individuals were asked how much additional insurance coverage they would be willing to buy, given the knowledge of their risk of developing moderate to advanced periodontal disease.

Methods

Instrument Development. The WTP questionnaire was developed according to protocols suggested by Portney (10) and O'Brien and Gafni (6,11). The symptoms of moderate to advanced adult periodontal disease were outlined and scenarios developed describing four choices that pa-

tients can make as a result of their diagnoses, as well as the risks and benefits of these alternatives in probabilistic terms. Data on the outcomes of the therapies were gathered from the literature whenever possible (12,13) and validated using expert opinion (see Reliability and Validity, section). The option of "no treatment" outlines the sequelae resulting from electing not to treat the disease (i.e., bad breath, increased tartar formation, drifting teeth, gum boils, potential extractions). Nonsurgical periodontal therapy includes four sessions of scaling and root planing under local anesthetic, followed by maintenance therapy three times a year for the subject's lifetime. The option of surgical therapy includes four sessions of scaling and root planing under local anesthetic followed by four periodontal surgeries and maintenance therapy three times a year for the patient's lifetime. While many types of periodontal surgery are available, the aim of all is to eliminate etiologic factors and produce an environment conducive to health. This broad definition of surgery is used here.

Following surgical therapy, patients who comply with the recommended maintenance schedule lose an average of one tooth every 10 or 12 years (14,15); those who are untreated and not maintained will lose about one tooth per year (16,17). The literature contains no reports using tooth loss as an outcome for patients who have received only nonsurgical periodontal therapy and maintenance. For the purposes of this study, we assumed that tooth loss with nonsurgical therapy for patients with advanced disease would be twice that of surgical patients (i.e., one tooth every four or five years). This estimate is based on reports that nonsurgical therapy is less effective in eradicating disease for patients with advanced periodontal disease (2,18).

The fourth option presented to subjects was to have all their teeth extracted at once, thereby permanently eliminating the disease. To restore function, complete upper and lower dentures are made. As the alveolar bone resorbs and the dentures fit less well, dentures are normally relined or remade every five to 10 years (19).

The treatment scenarios were organized in the form of four laminated folders ($8 \ 1/2'' \ x \ 11''$), one for each

treatment option. The first page of each folder presents the treatment choice and immediate outcomes of the treatment itself. The second page deals with long-term outcomes as a result of the treatment (or no treatment). The outcomes are grouped and color coded for easier comparison among treatment choices. These groupings include the treatment choice itself (including extractions as a result of progressing disease for the "no treatment" group), positive and negative immediate postoperative outcomes (e.g., improved breath, pain, and discomfort), longer term outcomes (e.g., tooth sensitivity, inability to eat well with dentures) and tooth loss as a result of recurrent disease.

The importance of measuring individuals' values in the context of uncertain outcomes is well established in health services research in order to reflect the uncertain nature of the outcomes of interventions (5). The standard gamble measurement method has been used in the context of cost-effectiveness analysis as a means of measuring individuals' values for uncertain outcomes (5). Under WTP, uncertainty associated with outcomes is incorporated into the treatment scenarios presented to individuals. In addition, because the WTP instrument is not confined to outcomes in the valuation procedure, it also is able to reflect the uncertain nature of individuals having a need for the service by consideration of the risk of suffering from the condition.

The risk of developing periodontal disease varies among individuals; thus, the probability that an individual may require periodontal therapy was included in the questionnaire. For subjects not identified as "periodontal" patients, the questionnaire included the respondents' risk of developing moderate to advanced adult periodontal disease within the next 10 years based on their age category (20) (Table 1). Although a number of risk factors are associated with periodontal disease-such as systemic health, smoking, and the presence of particular pathogens-age was used in this study for the sake of simplicity and because it is a nonmodifiable risk factor. The subject's age was determined at the beginning of the interview.

The portion of the questionnaire just described also is known as a decision instrument. It outlines the pros and cons of alternative treatment choices in probabilistic terms, thereby replicating day-to-day clinical decisions made under conditions of uncertainty. Decision instruments have been used to assist patients and their physicians in making appropriate health care choices in various medical situations, including the treatment of breast and ovarian cancer and leukemia (21-24).

The WTP portion of the survey was used to determine the maximum amount subjects would be willing to pay in terms of monthly dental insurance premiums to ensure their treatment of choice would be covered, given their risk for developing the disease. The WTP questions were framed in the form of a bidding game. Five dollars was selected as the starting bid and the bidding sequence was as follows: "Would you be willing to pay an additional \$5 per month in dental insurance premiums in order to have treatment X fully covered? Yes? Would you be willing to pay \$10?" After each positive response, the next bid was doubled (i.e., \$20, \$40, \$80). If the response was negative—i.e., \$5, yes; \$10, no-we confirmed that the lower bid was the maximum the subject would be willing to pay. If the subject was unsure, they were given the opportunity to state a lower bid than the last choice given. To ensure that the subject understood the impact that the amount of money they would pay would have on their lifestyle, they were asked to think of a similar payment they would have each month. They were told they would have this much less money per month to spend or save. Then confirmation was made that the original amount they were willing to pay was unchanged.

To determine the total benefits of a dental service, some consideration

must be given to those individuals who could be affected indirectly by the implementation of the service. In an attempt to evaluate the role of these "externalities," regardless of the subject's choice of therapy, they were asked the maximum they would be willing to pay (if anything) in additional dental insurance premiums for others in their immediate family and for co-workers to have insurance coverage for the periodontal surgery, should they require treatment in the future.

The demographic portion of the questionnaire asked the following: sex, age, level of education, employment status, household income, frequency of dental visits, previous dental history, history of periodontal disease and treatment, family history of periodontal disease, and type of dental insurance coverage at present.

Pretesting of the decision instrument was performed on a convenience sample of 15 dentally healthy volunteers made up of acquaintances, second-year dental students, and dental school employees from the University of Western Ontario, London, Ontario. Subjects were asked to imagine that they had advanced adult periodontal disease. A description of the signs and symptoms of the disease was given to them. Changes then were made to improve interpretability, clarity, and ease of administration of the decision instrument.

Pilot Study. A pilot test was then conducted on two groups of subjects. Approval was obtained from the Human Ethics Committee, Faculty of Dentistry, Dalhousie University, prior to commencement. Due to the length of the scenarios, this survey was done using personal interviews. Each subject signed a consent form at the beginning of the interview. The first group of subjects included patients attending the undergraduate dental clinic at Dalhousie University, Halifax, Nova Scotia, who had been diagnosed with moderate to advanced adult periodontal disease. The following inclusion criteria were used: systemically healthy adults over the age of 35 years who had been diagnosed with moderate to advanced attachment loss and displayed a good understanding of the English language as determined during the initial telephone contact. A computer list was generated consisting of 128 patients who were telephoned during working hours. Four attempts were made to contact each patient. Of the original 128 patients, 46 (35.9%) were contacted, 34 (73.9%) of whom met the inclusion criteria. Of these, 10 patients were not available to participate due to undetermined reasons; 24 (52.2% of those contacted; 18.8% from the original patient list) were available and willing to participate in the study.

The second group of subjects was made up of a convenience sample of faculty and staff at the Faculty of Dentistry at Dalhousie University. These subjects were enrolled in a benefits program that has partial coverage of periodontal benefits. Twenty subjects were contacted. Nine were faculty members and 11 were staff. Eighteen (90%) agreed to enter the study; two (clinical faculty) were unable to participate due to time commitments.

Validity and Reliability. After the treatment scenarios were developed, they were examined for face and content validity by a convenience sample of colleagues including four periodontists, two prosthodontists, and two general dentists in London, Ontario. They reviewed the questionnaire and made suggestions to ensure that the scenarios represented true choices and outcomes faced by patients in daily clinical practice. This step is a critical one because a dearth of evidence exists relating to probabilities of both longand short-term outcomes of dental treatments. Several academic dentists (n=7) and dental assistants (n=5) from Halifax participated in the pilot study that provided a further testing of the validity. The inclusion of periodontal patients also allowed the opportunity to ensure that these outcomes were accurately portrayed from a patient's point of view.

Construct validity is assessed by testing mini-theories or hypotheses designed to explain the relationships between variables (25). In this pilot study, four constructs or hypotheses were tested. The first was that manipulation of the outcomes of the selected treatment would lead to a shift in expressed preference. For example, if the subject preferred surgery, the scenarios were altered such that a dramatic increase occurred in the amount of postoperative pain and discomfort and in the number of teeth lost due to failed therapy. We then expected that, faced with these different outcomes,

| Risk of Developing Moderate to Advanced Periodontal Disease According to Age Category (20) | | | | |
|--|-------------------|------------|--|--|
| Age Group (Years) | Prevalence (%) | Probablity | | |

TABLE 1

| (Years) | (%) | Probablity |
|---------|------|------------|
| 25-34 | 3.2 | 1/31 |
| 35-44 | 8.4 | 1/12 |
| 45-54 | 16.7 | 1/6 |
| 5564 | 20.7 | 1/5 |
| 65–74 | 26.8 | 1/4 |
| | | |

| IADLE 2 |
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| Percent Distribution of Respondents by Sociodemographic and Periodontal |
| Characteristics and Sample Group (n=41) |
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| | Group | | | |
|---------------------------|----------|-----------|-------|---------|
| Characteristic | Patients | Fac/Staff | Total | P-value |
| Sex | | | | |
| Male | 57 | 39 | 49 | |
| Female | 43 | 61 | 51 | .270 |
| Age (years) | | | | |
| <25 | 0 | 17 | 7.5 | |
| 25–34 | 0 | 28 | 12 | |
| 35-44 | 17 | 22 | 20 | |
| 45–54 | 22 | 17 | 20 | |
| 55–64 | 30 | 17 | 24 | |
| 6574 | 26 | 0 | 15 | |
| >74 | 4.3 | 0 | 2.4 | .001 |
| Education completed | | | | |
| Primary school | 17 | 0 | 9.8 | |
| High school | 44 | 11 | 29 | |
| College/university | 39 | 89 | 63 | .003 |
| Employment status | | | | |
| Employed full-time | 0 | 83 | 37 | |
| Employed part-time | 8.7 | 11 | 9.8 | |
| Retired | 52 | 0 | 29 | |
| Student | 17 | 5.5 | 12 | |
| Unemployed | 22 | 0 | 12 | .008 |
| Income | | | | |
| <\$25,000 | 26 | 39 | 32 | |
| \$25,000-\$49,999 | 39 | 11 | 27 | |
| \$50,000-\$74,999 | 17 | 17 | 17 | |
| ≥\$75,000 | 13 | 33.3 | 22 | .170 |
| History of perio. surgery | | | | |
| Yes | 48 | 17 | 33 | |
| No | 52 | 83 | 66 | .040 |
| Awareness of own | | | | |
| periodontal disease | | | | |
| Yes | 61 | 17 | 42 | |
| No | 30 | 83 | 54 | |
| Don't know | 8.7 | 0 | 4.9 | .080 |
| Treatment preference | | | | |
| Surgery | 70 | 72 | 71 | |
| Deep cleaning | 26 | 28 | 27 | |
| Dentures | 4.3 | 0 | 2.4 | |
| No treatment | 0 | 0 | 0 | .740 |
| | | | | |

*P-values based on between-group contrasts of nonmissing values using chi-square.

patients would change their preference to nonsurgical periodontal therapy.

A second construct hypothesized that subjects with a history of periodontal disease would be more likely to choose periodontal surgery than subjects who did not have the disease. As periodontal patients face a real risk of losing their teeth, we expected that they would be more willing to risk the morbidity of surgery for an increased chance at saving their teeth.

The third construct hypothesized that willingness to pay would be positively related to income. In other words, we expect that the amount an individual is willing to pay would be correlated with their ability to pay (26,27).

Finally, we expected that people would be willing to pay more to ensure coverage for periodontal services for themselves, should they need it than they would for others.

A measure cannot be valid unless it is reliable; that is, the measure should achieve the same result when administered repeatedly under similar conditions. Test-retest reliability was determined by administering the questionnaire on two separate occasions, a minimum of two weeks apart (minimum=14 days; maximum=23 days).

Statistics. Statistics are reported either as means with standard deviations, counts, or proportions, as appropriate. The Mann-Whitney U-test was performed to determine differences between the two groups of participants and is reported as the two-tailed P-value corrected for ties. WTP for each individual was converted to continuous data by taking the midpoint in the WTP response interval. Comparisons were made using mean adjusted WTP (6,24). Tests of association between responses for WTP and demographic characteristics were performed using analysis of variance (ANOVA). To assess the effect of an individual's ability to pay on their preference, we compared preferences and WTP across income groups (3). Reliability for treatment preferences and WTP amounts were measured using the intraclass correlation coefficient and kappa statistic, respectively (28).

Results

Demographic Data. Forty-two subjects were involved in this pilot study, 24 subjects with advanced periodontal disease and 18 faculty and staff. Data for one patient were incomplete due to his inability to understand the questions and therefore were not used. The demographic data are presented in Table 2. As expected, significant differences were found in the demographic characteristics of the two groups: the patient group generally was made up of retirees over the age of 55, with a high school education, who had undergone periodontal surgery.

Treatment Preferences. The average length of time to complete the decision instrument portion of the survey was 20 minutes. The decision instrument was well accepted by nearly all subjects. Most felt that the instrument was easy to understand and clearly outlined all the outcomes of the alternative choices. Many of the periodontal patients stated that they wished someone had given them this information earlier. Two faculty members thought that the risk of tooth loss for nonsurgical therapy was overstated, however. Four subjects had difficulty relating to the hypothetical scenarios. After further explanation by the interviewer, all but one understood the purpose of the questionnaire. The data for this latter subject were not used.

As shown in Table 2, the most preferred treatment for moderate to advanced adult periodontal disease was periodontal surgery (71%; n=29). Nonsurgical periodontal therapy was preferred by 27 percent of the subjects (n=11), while one subject preferred extractions and dentures. None of the subjects chose "no treatment."

Some of the subjects identified as periodontal patients were not aware that they had periodontal disease. Thus, we also examined the groups according to those who thought they had periodontal disease and those who didn't. No differences are found between the patient and the faculty/staff groups in terms of preferences (P=.74), nor between subjects who were aware that they had periodontal disease and those who were not (P=.14; Fisher's two-tailed exact test; Table 3). However, a trend suggested that those who had experienced periodontal surgery were more likely to choose surgery than nonsurgical treatment (*P*=.06; Fisher's two-tailed exact test; Table 3).

In addition to stating their preference, subjects were asked the reasons for their choice. For the respondents who preferred nonsurgical therapy, most did not like "the thought of surgery." One dental assistant said that she has seen periodontal surgery and "wouldn't want to ever go through that." One subject chose nonsurgical therapy because "the thought of spending all that time in the dental chair is not very appealing." Others said that if they were younger they might prefer periodontal surgery, but not at this point in their lives. In other words, while none of the options offered predictable outcomes, deep cleaning seemed to have the least discomfort and was the least invasive alternative for this group.

Of those who chose surgical therapy, the primary reason was a lower risk of tooth loss. Several subjects stated that they would do anything to keep their teeth, and that the shortterm morbidity of surgery was outweighed by that desire.

The individual who chose to have extractions and dentures to treat his periodontal disease visited the dentist only for emergencies. He felt that there were no guarantees of keeping one's teeth with any of the choices offered. In contrast, two of the subjects had complete upper dentures and wished that they had sought periodontal advice earlier.

Willingness to Pay. The WTP questions took approximately 10 minutes to complete. All subjects but one (the

 TABLE 3

 Percent Distribution of Respondents by Periodontal Characteristics and Treatment Preference

| | Preference (%) | | |
|------------------------|-------------------|-------------------------|----------|
| | Surgery (n=29) | Deep Cleaning (n=11) | P-value* |
| Awareness of own | | | |
| periodontal disease | | | |
| Aware | 82.4 | 11.8 | |
| Unaware | 62.5 | 37.5 | .14 |
| History of periodontal | | | |
| surgery | | | |
| Yes | 92.9 | 7.1 | |
| No | 59.3 | 37.0 | .06 |

*P-value based on Fisher's two-tailed exact test.

patient whose data were excluded) reported that this portion of the questionnaire was easy to understand and relevant. One subject refused to answer income-related questions, including willingness to pay questions. All subjects were willing to pay additional insurance premiums to ensure coverage for the treatment of their choice regardless of their age (or risk) of developing periodontal disease (P=.79).

No differences were found in the amount individuals were willing to pay by the respondent's knowledge of their disease (P=.15), history of periodontal surgery (P=.39), or whether or not the subject had dental insurance (P=.26). A significant difference between the amount subjects were willing to pay existed across income levels (ANOVA; P=.05). The mean adjusted WTP increased with increasing income-for an annual household income of <\$25,000 Canadian, the mean WTP=\$18.67 (SD=\$8.96); \$25,000-\$49,999, mean WTP=\$32.00 (SD= \$10.33); \$50,000-\$74,999, mean WTP= \$32.86 (SD=\$9.51); ≥\$75,000, mean WTP=\$34.17 (SD=\$14.29).

Validity and Reliability. Four hypotheses were tested with this pilot study: that subjects would change their preferences when the outcomes of their treatment choice were altered, that those with a history of periodontal disease would be more likely to choose surgery, that WTP would be positively related to income, and that individuals would pay more for themselves than others.

Thirty-eight of the 41 subjects (92.7%) changed their preferences predictably when the negative outcomes of their treatment choice were exaggerated (P<.001). None of the subjects switched preferences when the immediate or intermediate term outcomes (e.g., pain and discomfort, thermal sensitivity) were made worse. All changed preferences when the risk of tooth loss was increased. Three subjects did not change their original preferences. When questioned as to the reason, all three felt that the "extreme" scenarios were not realistic and that they had originally made the right choice.

Although there was no difference between patients and nonpatients, nor between those who were aware of their periodontal disease and those who were not in terms of preference, there was a trend suggesting that those who had previously undergone periodontal surgery were more likely to choose surgery again.

WTP was positively related to household income level, as expected. Table 4 shows the effect of ability to pay on preference. Comparing preference groups (i.e., surgical or nonsurgical therapy) there is a trend that the WTP for surgical treatment is higher than the WTP for nonsurgical therapy for all income groups.

Two-thirds of all respondents were willing to pay an additional premium so that others in their immediate family would have coverage for periodontal surgery (mean=\$17.59; SD=\$14.69). Of those not willing to pay for family coverage, the majority (9/13) had no dependent children, but were married. Only one-third were willing to pay for periodontal services should others in their insurance domain require them (mean=\$8.58; SD=\$11.31).

Reliability was determined by administering the same questionnaire to all patients on two occasions, separated by a minimum of two weeks (minimum=14 days; maximum=23 days). The intraclass-correlation coefficient for treatment preference was 0.95 (*P*<.001) and the kappa statistic for WTP questions was 0.78 (*P*<.001).

Discussion

Willingness to pay measures are useful tools with which to assess public health programs using cost-benefit analysis (6-8,27). The purpose of this study was to develop and pretest a tool which can be used to assess either public health programs or insurancebased services. In the setting in which it was tested, the method was valid, reliable, and feasible. Some researchers (9) have reported that the use of hypothetical situations may be a problem in administering WTP questionnaires in terms of cognition and believability. In this study only one subject had difficulty relating to the hypothetical scenarios, which was not overcome by further explanations by the interviewer. By obtaining consensus on the content of the scenarios, we found that the treatment processes and outcomes described in the scenarios were credible and realistic. However, some concern was expressed about the estimate of tooth loss due to recurrent disease after nonsurgical therapy. This number is an estimation
 TABLE 4

 Mean WTP per Respondent by Treatment Preference and Income Group

| - Preference | Income (1997 Canadian \$) | | | |
|---------------------|------------------------------|--------------------------|--------------------------------|-----------------------------|
| | <\$25,000 (<i>n</i> =14) | \$25K-\$49,999 (n=10) | \$50K–74,999 (<i>n</i> =7) | ≥\$75,000 (<i>n</i> =6) |
| Deep cleaning | 20.00 (3) | 20.00 (1) | 17.50 (2) | 22.50 (3) |
| Periodontal surgery | 26.66 (11) | 33.33 (9) | 34.00 (5) | 40.00 (3) |

only and, based on feedback from clinicians, will be adjusted for future use. Insurance-based questions for payment of dental care also were easy for the subjects to relate to, in addition to being based in sound economic theory (6,29).

In this study, most subjects preferred periodontal surgery. No subjects chose "no treatment," and only one preferred extractions and dentures. These findings are not surprising, considering the sample selected. Faculty, staff, and patients at a dental school are likely to have a high "dental IQ" and place a high value on retention of their teeth. Possibly, a sample of patients from a general dentist's office or a sample from the general population would make different choices.

Gafni (6) argues that to make reimbursement decisions in insurancefunded programs, the insurance-paying public should be asked questions about their willingness to pledge extra insurance dollars for a treatment with specific expected health benefits. This approach allows us to explore some important aspects of health care market failure, including the presence of externalities and option values. Externalities are determined by sampling nonuser groups, in this case individuals who may not need nor choose to have periodontal treatment. Externalities capture the value gained by one individual from another individual having access to periodontal therapy, be it a family member, a co-worker, or a stranger (11). The strength of the externality may be greater for family members than strangers, but the nature of the benefit is the same.

Most WTP studies have involved only patients or ex-patients (7, 30-32). For the purposes of developing and testing an instrument, our sample was confined to patients and potential patients. However, these user-based estimates do not provide an accurate estimate of the social values of a program because they do not include the dollar values of nonusers. Thus, when designing future WTP studies, one should sample from every group who could benefit directly (i.e., patients) and indirectly (i.e., co-workers and family members of patients) to accurately determine the total benefits of a service. To determine a community's WTP for programs for which only part of the community will benefit at any one point in time, but from which any member might benefit from at some point in their lifetime, it is important to select a representative sample. Such an approach will determine whether the total money collected in additional premiums (or taxes in a tax-based system) (33) would more than offset the additional cost of providing the program.

Additionally, to establish a net social value, one must measure the community's perceived value of all possible treatments, not just the WTP for the program preferred by the majority. At the individual level, the preferred option and the strength of preference may coincide; however, they need not coincide at a population level. For example, 70 percent of the population might prefer program A to program B. However, the strength of preference (i.e., WTP) of the other 30 percent of the population for program B might mean that B produces more social value. Donaldson (33) provides an example of this result in a comparison of preferences for hospital and nursing home care for the elderly in the UK.

Another way in which nonuser values are important is in a contingent valuation study. Using an *ex ante* insurance-based approach, individuals who are not currently diseased are asked if they would be willing to pay some amount now so that treatment services would be available should they need them in the future—an option value (34). This method necessitates some determination of the risk of developing the disease; here, age was used to determine risk categories. All subjects in this study were willing to pay some amount, regardless of risk. In a larger sample we may find that individuals at low risk of developing the disease are not willing to pay for an option value.

WTP studies typically measure construct validity-the degree to which findings are consistent with theoretical expectations (8,29). It is well accepted that WTP is likely to be correlated to income (3,7-9), which was confirmed in our study. This income effect also can be considered a disadvantage of WTP. Because the wealthy have greater purchasing power than the poor, they can have a greater influence on decisions about resource allocation. This effect is true only if the distribution of preferences is different across socioeconomic groups. Furthermore, in terms of policy implications, WTP is not being used to determine eligibility or access to services. This determination requires a separate decision. It is only being used to determine if the total benefits from a program as viewed by the community exceed its costs. Our results show that there was no difference across the groups with respect to preferences. In this study, therefore, the results do not appear to be unduly influenced by ability to pay.

Sackett and Torrance (35) found that individuals in a particular health state gave higher values to that health state than those who had not experienced it. Thus, we would also expect an increased WTP with an increase in perceived need for treatment. While a trend suggesting that periodontal patients are willing to pay more than individuals without periodontal disease was found, it was not statistically significant. One explanation could be the sample selection method. The faculty/staff group is presumably made up of individuals with a high valuation of dental health, even though they may be periodontally healthy.

In addition to being a valuable decision tool for insurance programs, the decision instrument portion of the questionnaire easily could be adapted to assist in clinical decision making. In the medical field, various studies (36,37) suggest that problems exist with the transfer of important information between the patient and the physician at the point of decision making. We have no reason to believe dentists are any more adept than physicians at informing patients of the risks and benefits of alternative therapies; thus, this tool could be used as a chairside decision instrument, or adapted to provide patients with a take-home version outlining the risks and benefits of no treatment versus periodontal treatment. The take-home version would allow patients some time to discuss their options with others whose lives may be affected by their choice (i.e., family members) and could give the patient another opportunity to ask questions of their periodontitist or general dentist.

This model of shared, as opposed to paternalistic, decision making (38) has been used in various medical scenarios, including treatment for breast and ovarian cancers and leukemia (21-24). By informing patients of the risks and benefits of alternative forms of therapy, they are allowed and even encouraged to take part in the decisionmaking process. Several of the subjects in this study, however, said their decision would depend upon what their dentist recommended.

This study is the first of its kind to measure preferences for periodontal treatment alternatives and individuals' willingness to pay for their preferences. It is unique in that the decision instrument could be used for economic analysis and clinical decision making. [Further discussion on how to use a decision instrument for both purposes can be found elsewhere (39).] In addition, this questionnaire could serve as a model for choices among other dental therapies. Caution must be exercised in making generalizations about the results of this pilot test, however, as the sample chosen for the pilot study was highly biased and small in size. Despite these limitations, the questionnaire was well accepted and easily understood. In this setting the WTP method was highly reliable and some support for its validity was observed. Further testing on larger samples is required to confirm the results from this pilot test.

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