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Which factors influence willingness-to-pay for orthognathic treatment?

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SUMMARY The aims of this interview-based questionnaire study were to establish which factors influence willingness-to-pay (WTP) for orthognathic treatment and to compare WTP values, from both members of the general public and orthognathic patients, with the actual cost of treatment, the hypothesis being that the more highly valued the intervention, the higher the WTP value.

Data were collected from 88 orthognathic patients and a convenience sample of 100 adults using the so-called 'payment card' method. Demographic data were recorded, as well as ability to pay, incisor relationship, occupation, and level of education. In addition, the resources used in orthognathic treatment were estimated for five patients who participated in the study.

The results showed that there was a significant difference between the mean WTP values for the public and patient groups. Patients were prepared to pay €2750 more than members of the general public. In addition, a significant relationship was found between WTP and incisor relationship in the patient group, with Class II division 1 patients prepared to pay €3130 more than those with Class III malocclusions. Ability to pay did not significantly affect WTP. The mean total costs estimated for orthognathic treatment were lower than the mean patient WTP value and similar to the mean WTP value for the public group.

In terms of cost-benefit, it appears that orthognathic treatment provides 'good value for money'. This study also showed that both patients and the general public were prepared to place a monetary value on the correction of dentofacial deformity and that this form of economic evaluation is a useful tool in monitoring health care in the UK.

Introduction

Economic analysis provides objective information so that decisions can be made between several courses of action or regarding the allocation of limited resources (Drummond *et al.*, 1987). This is becoming increasingly important in health care as resource constraints necessitate decisions regarding the allocation of funds. Decisions may be made by those who plan, provide, receive, or pay for health services. Costs and outcomes of different treatment methods, public health policies or alternative health care services can be compared to ensure the optimum outcome (health gain) is obtained from any given budget.

A number of methods of economic evaluation are quoted in the literature (Drummond *et al.*, 1987; Donaldson, 1990; Robinson, 1993; Zarnke *et al.*, 1997):

- cost-minimization analysis
- cost-effectiveness analysis
- cost-utility analysis
- cost-benefit analysis

They all vary in the way that costs and outcomes are utilized to produce an end analysis and have been described as useful tools in the decision-making process. None is designed to be foolproof or to remove the responsibility from the decision maker, but aim to help in this decision-making process. The evaluation may be based on the viewpoint of the individual patient, the hospital, the National Health Service (NHS), other insurance agencies or societies. Utilizing the broadest viewpoint as a whole (society) ensures that all costs and benefits are included.

Cost-benefit analysis is the most comprehensive and theoretically sound form of economic evaluation. Willingness-to-pay (WTP) is a way of measuring benefit in monetary terms in cost-benefit analysis. WTP is a form of contingent valuation which was originally developed in environmental economics. There are several approaches in contingent valuation studies, but WTP is used most commonly (Mishan, 1971; Gafni, 1991). It seeks to assign monetary values to both the costs and outcomes of health care and to calculate the net benefit. In the context of health, this approach seeks to establish what value people attach to health care outcomes or interventions by asking them how much they would be prepared to pay to obtain the benefits of treatment or avoid the negative aspects of illness. The net benefit to society is whether the total benefits exceed the costs. Therefore, a single measure of effectiveness of the programme is produced so the decision maker can decide where funds should be directed. It allows people to express the benefits of health care in terms of their valuations of quality and/or quantity of life and any other dimensions that they feel are important. These preferences represent the individual's desire for a particular health state (Matthews *et al.*, 1999).

Health gain, although probably the most important factor, is not the only attribute of health care (Gerard and Mooney, 1993; Donaldson *et al.*, 1995b). Other important areas include the consumption and 'process' of care, as well as dignity and autonomy. If all of the above considerations are ignored, then it is likely that the measurement of health gain alone would produce a suboptimal provision of the service and may underestimate the effectiveness of a practice. WTP is able to account for these issues. Therefore, it measures the respondent's true strength of preference. Decisions are then made on accurate measurements of people's values and thus used for the maximum benefit to society rather than on what the policy makers believe to be correct. A number of studies have attempted to establish the existence of, and to measure, process effects (Donaldson and Shackley, 1997). Others have aimed to investigate the magnitude of these attributes (Berwick and Weinstein, 1985). It may be more difficult to measure such process effects with a cost-effectiveness or cost-utility analysis and thus these analyses may fail to represent patients' values fully.

There are a number of methods of measuring WTP. The payment card method is said to increase the response rate due to the ease of use and also reduces the risk of starting point bias (where the maximum WTP depends on the first bid given by the interviewer). The payment card method may be influenced by the range of presented amounts. However, Donaldson *et al.* (1995a) stated that this method was more valid than other available techniques. There remain some concerns regarding the validity and reliability of the methods in application and further studies can only improve on a method that already has a place in economic evaluation as a useful measurement tool (Klose, 1999).

To-date, WTP investigations in health care have tended to be pilot studies and, in dentistry, research has been limited to studies of the benefits of water fluoridation (Dixon and Shackley, 1999) and orthognathic treatment (Cunningham and Hunt, 2000).

This study aimed to determine the factors that influence WTP for orthognathic treatment and to establish whether this form of economic evaluation is a useful tool in evaluating health care in the UK. This included a comparison of WTP values from members of the general public (societal viewpoint) and orthognathic patients (patient viewpoint) and also a comparison of WTP values from both groups with the actual costs of orthognathic treatment.

Materials and methods

Ethical approval was obtained from the Joint Research and Ethics Committee. All subjects were given an information sheet regarding the purpose of the study and written informed consent was obtained.

This was an interview-based study in which data were collected from a convenience sample of 100 adults (non-patients) and 88 orthognathic patients. Sixty-seven of the patient group were pre-surgery and 21 post-surgery. All patients were undergoing treatment in the same unit.

The orthognathic treatment process was explained to all subjects, using photographs of patients before and after treatment as examples. These photographs represented both male and female subjects with Class II and Class III skeletal discrepancies and showed facial and dental changes. This ensured that all subjects were evaluating similar health concepts.

WTP was measured using the so-called payment card method. This method involved the use of a series of cards with values ranging from £0 to £10 000 in increments of £1000. The respondents were asked to select the maximum value they would be willing to pay for the correction of a dentofacial deformity. If the respondent stated greater than £10 000, then values in £1000 increments were quoted until the maximum WTP value was reached. If the subjects were not prepared to pay any amount, this was recorded as £0 to allow preferences to be accurately expressed.

Demographic data (age, gender, and ethnic group) were recorded, as well as ability to pay, incisor relationship (British Standards Institute, 1983), occupation, level of education, and their current quality of life. Ability to pay was represented by the Townsend deprivation score utilizing postcodes for each respondent (Townsend *et al.*, 1986). The Townsend score measures socio-economic status using four components: car ownership, home ownership, overcrowding and unemployment. The use of the Townsend score in inner cities is problematic due to mixed social groups in discrete geographical areas, but was used in preference to actual household income for reasons which are discussed later. Quality of life was measured using the orthognathic quality of life questionnaire (OQLQ; Cunningham *et al.*, 2000, 2002). This is a condition-specific quality of life measure that has been found to be reliable, valid, and responsive with a high level of acceptability. It consists of four subsections or 'domains': social aspects of dentofacial deformity, dentofacial aesthetics, oral function, and awareness of dentofacial deformity.

In order to evaluate the repeatability of the WTP method, 20 respondents (including both patients and the general public) were interviewed a second time 6–8 weeks after the first interview.

Estimation of the costs involved in orthognathic treatment

The resources used in orthognathic treatment were calculated for five subjects who had been interviewed. Of these individuals, three underwent bimaxillary surgery and two single jaw procedures. The resources were divided into the following.

Orthodontic costs. The resource use for each subject was calculated using the so-called 'bottom-up' approach

based on the number and duration of each visit; the grade of clinician and nurse involved at each visit; the exact sequence of archwires used and all other consumables. This information was derived from the patients' hospital notes and patient administration system.

Joint orthodontic/surgical clinic costs. Resource use included pre- and post-surgery joint clinics (based on the staff present at each clinic), as well as the costs for the model surgery, wafer construction and pre-operative clerking.

In-patient stay cost. This was difficult to calculate. Therefore, *per diem* costs were used. The quoted value from the local health authority in question was £150 per night. This compares well with values used in other studies when inflation is taken into account (Sculpher *et al.*, 1996).

Operating costs. Theatre costs were also calculated using the 'bottom-up' approach based on cost per minute to run the operating theatre (including overheads and non-clinical staff), plus the cost of all staff and consumables. The cost per minute for the local health authority in question was quoted as £1.67. Staff costs were calculated from the clinicians and personnel present during the operating procedure as obtained from the patients' notes. Costs for consumables were estimated based on known use of certain consumables, and the number of titanium screws and plates was calculated for each individual patient. Anaesthetic agents and drugs used were assessed from drug charts.

Miscellaneous costs. Four of the subjects required routine dental treatment during their orthognathic treatment period as part of the treatment plan, e.g. extractions, hygiene therapy, or restorative treatment. These costs were calculated from the British Dental Association NHS Fees Guide (Dental Practice Board, 2001).

In this study, no consideration was given to the costs borne by the patients and their families or external costs, e.g. income lost due to time off work. Resources were measured purely from a NHS perspective.

All monetary values were converted from Sterling to Euros using the October 2002 exchange rate.

Statistical analysis

Analysis of the data was performed using the SPSS for Windows package 11.0 (SPSS Corporation, Chicago, Illinois, USA). The data were subjected to descriptive statistics including 95 per cent confidence intervals (CI).

In order to establish which factors influenced WTP, multiple linear regression analysis was undertaken. The data were divided into groups and all variables (Table 1) were initially subjected to univariate analysis at the 20 per cent level in order to determine which variables would be entered into the regression analysis. All assumptions of multiple linear regression were satisfied. A number of different linear regression analyses were undertaken:

1. all subjects (patients and public);
2. public and pre-surgery group only;
3. public only group;
4. patient group 1 (pre- and post-surgery);
5. patient group 2 (pre-surgery only).

The sample size of the post-surgery group was small ($n = 21$). Therefore, a decision was made not to compare the public and post-surgery group independently.

Binary variables, such as gender and group, were allocated values of 1 or 0 prior to modelling. Dummy variables were created for variables with more than one category, such as ethnicity (Caucasian, Asian, Black African/Afro-Caribbean, and Chinese) and incisor relationship (Class I, Class II division 1, Class II division 2, Class III). The reference category was that for which all dummy variables adopted the value 0 and was the largest group, against which the other dummies were contrasted. For the ethnic groups, the largest group was Caucasian and for the incisor relationship, Class III. This was altered in subsequent models to allow a comparison of alternative combinations. An interaction

Table 1 Variables subjected to univariate analysis.

Variable	Label
Group	Patient/general public (all subjects model) Pre-/post-surgery (patient model 1)
Age	Years
Gender	Male, female
Ethnic group	Caucasian, Asian, Black African/Afro-Caribbean, Chinese
Townsend score	Numerical value
Employment	Paid, non-paid occupation
Incisor relationship	Class I, Class II division 1, Class II division 2, Class III
Quality of life domain	Social aspects of dentofacial deformity Dentofacial aesthetics Oral function Awareness of dentofacial deformity
Previous orthodontics	Fixed appliance treatment
Awareness of orthognathic treatment on referral	Knowledge of orthognathic treatment on referral

variable (gender and incisor relationship) was also created and entered into the relevant models.

The repeatability data were subjected to the Bland and Altman method (Altman, 1991) and an intraclass correlation coefficient (ICC) was calculated (Streiner and Norman, 1995).

Results

In this study, good repeatability of the method was found. The ICC results were all within the acceptable range, with values above 0.70. Absence of bias was shown in the Bland and Altman method by all paired *t*-tests giving non-significant results and, in addition, the 95 per cent limits of agreement were acceptable.

All variables were initially subjected to a univariate analysis, as shown in Table 1. Those variables significant at the 20 per cent level and subsequently entered into the multiple linear regression models are shown in Table 2 (see further discussion later).

Table 3 illustrates the demographic data for both the general public and patient groups. The mean age of the general public group was 33.3 years (95 per cent CI 31.2–35.4 years) compared with 25.2 years (95 per cent CI 24.2–27.6 years) in the patient group. The mean ages for the pre- and post-surgery groups were similar. The male:female ratio was approximately 1:2 in all groups except the post-surgery group where there was a higher proportion of females. The majority of respondents were Caucasian (approximately 76.0 per cent), followed by Afro-Caribbean (9.5–15.0 per cent) and Asian (7.0–14.3 per cent). The smallest group of respondents were of Oriental/South East Asian origin (approximately 2 per cent).

The mean WTP value (Table 4) in the general public group was €5230 (95 per cent CI €4209–6250) and in the patient group €7996 (95 per cent CI €1889–9349). The mean WTP value in the post-surgery group was €9056 (95 per cent CI €5829–12 283) compared with €7664 (95 per cent CI €6153–9168) in the pre-surgery group.

Table 5 shows the 'breakdown' and total resource use for each individual patient. The mean total resource use was €6134.

The variables included in each of the multiple regression models and the multiple linear regression data for each model are recorded in Table 2. Dummy variables for incisor relationship were created in patient groups 1 and 2 with the reference category as the largest group (Class III). As it was also felt that there may be some interaction between gender and incisor relationship (e.g. Class III may be perceived as more disfiguring in a female than a male), an interaction variable was created and entered into additional regression models. No significant results were found using this interaction.

Discussion

In this study, the preferences of both users and non-users of an orthognathic service were assessed in order to estimate the total benefits to society more accurately. For this reason it was necessary to have a true representative sample. Thus, patients (both pre- and post-surgery) were interviewed, as well as representatives of the general public.

All respondents appeared to understand the hypothetical situation described to them and answered the questions readily. The information given to both the public and patient groups was deemed satisfactory, by an independent panel of clinicians, to enable the situation to be understood even though most of the

Table 2 Variables included in the multiple regression models.

Multiple linear regression model	Variables found to be significant in the univariate analysis	Significant variable	*P*-value
All subjects	Group (public or patient)		
	QOL function		
	GDP registration		
	Awareness of orthognathic treatment on referral	Group (patient/ public)	0.009**
Public and pre-surgery group	Group (public or patient)		
	QOL social aspects		
	QOL function		
	GDP registration	QOL social aspects	0.031*
Public group	Townsend score		
	Previous orthodontic treatment	Townsend score	ns ($P = 0.068$)
Patient group 1 (pre- and post-surgery)	Incisor relationship		
	QOL social aspects	Malocclusion type (Class II division 1)	0.031*
Patient group 2 (pre-surgery only)	Age		
	Malocclusion		
	QOL social aspects		
	QOL function		
	GDP registration	Malocclusion type (Class II division 1)	0.020*

*$P < 0.05$; **$P < 0.001$.
QOL, quality of life; GDP, general dental practitioner.

Table 3 Demographic details.

Variables	Public group (n = 100)	Patient group		
		Pre-surgery (n = 67)	Post-surgery (n = 21)	Pre- and post-surgery (n = 88)
Age (years)				
Mean (95% CI)	33.3 (31.2–35.4)	25.7 (23.7–27.6)	26.6 (22.7–30.5)	25.2 (24.2–27.6)
Median (95% CI)	31.0 (28.0–34.0)	24.0 (21.0–27.0)	24.0 (19.0–34.0)	24.0 (21.0–26.0)
Standard deviation	10.7	7.9	8.6	8.0
Range	17–63	15–46	17–47	15–47
Gender				
Male:female (%)	33:67	34:66	19:81	31:69
Ethnic group (%)				
Caucasian	76.0	76.2	76.2	76.1
Asian	7.0	10.4	14.3	11.4
Afro-Caribbean	15.0	10.4	9.5	10.2
Oriental/South East Asian	2.0	3.0	0	2.3

CI, confidence interval.

Table 4 Willingness-to-pay data (maximum) in Euros (October 2002 exchange rate).

Variables	Public group (n = 100) €	Patient group		
		Pre-surgery (n = 67) €	Post-surgery (n = 21) €	Pre- and post-surgery (n = 88) €
Mean (95% CI)	5230 (4209–6250)	7664 (6153–9168)	9056 (5829–12 283)	7996 (1889–9349)
Median (95% CI)	3170 (3170–4754)	6339 (4754–7924)	6339 (3170–15 848)	6339 (4754–7924)
Standard deviation	5144	6166	7090	6384
Range	0–23 772	0–25 357	0–23 772	0–25 357

CI, confidence interval.

Table 5 Resource use for individual patients 1–5 (October 2002 exchange rate).

Patient	Orthodontic costs €	Joint orthodontic and surgical costs €	Surgical costs €	Miscellaneous costs €	Total €
Patient 1 (bimaxillary)	1358	906	3970	153	6387
Patient 2 (single jaw)	1394	1906	2273	278	5851
Patient 3 (bimaxillary)	1449	1617	3951	184	7201
Patient 4 (bimaxillary)	1386	810	3365	111	5672
Patient 5 (single jaw)	1868	841	2651	199	5559
Mean resource use	1491	1216	3242	185	6134

general public group knew little about orthognathic treatment prior to the interview. This study, therefore, confirmed that the WTP method was acceptable to both groups. This was important as the majority of previous WTP health care studies have been carried out in the USA, where payment for health care is the norm and the WTP concept may, therefore, be more readily understood.

It must be stressed that the public group was a convenience sample and may, therefore, not be truly representative of the population and caution should be applied when making statements about this population. When interpreting the data it must also be noted that the subjects from this particular hospital cannot be assumed to be the same as patients from other hospitals. This is primarily due to differing referral/catchment areas.

Demographic data

The mean age of the patient group was 25.2 years (95 per cent CI 24.2–27.6 years) which is probably slightly older than in some units where patients are often treated at 17–18 years of age (Table 3). This may be due to the fact that the study was carried out in a large teaching hospital and such units often have a much more 'mobile' population than the referral base to district general hospitals. In addition, these teaching institutes are able to accept complex cases undergoing

combined orthodontic/restorative/surgical treatment and these patients may well be in the older age group.

The gender ratios in both the patient and public groups were similar with a male:female ratio of approximately 1:2 (Table 3). It is recognized that females tend to express more concern about their facial appearance and are more likely to attend for surgery, thus supporting the traditional gender stereotypes (Hay, 1970). In an earlier study on gender differences and motives for orthognathic surgery, it was found that both males and females were equally concerned about their appearance and that there were other motives such as mastication and speech which encouraged both males and females to seek treatment (Kiyak *et al.*, 1981). Interestingly, this was not reflected in the results of the present study.

The percentages within the ethnic groups (Table 3) reflect the data on ethnic groups in London (Office for National Statistics, 1998). The ethnic minority groups are not evenly distributed around England and Wales and nearly half of the ethnic minority population lives in Greater London. This is an important issue as it may affect orthognathic treatment planning and all patients should be treated to the norm of their particular ethnic group to ensure a successful result.

WTP data

Following the univariate analysis, the variables included in each multiple linear regression model can be seen in Table 2. An interesting point to note is that neither gender nor ethnic groups were factors that appeared to affect WTP. In a study of mammography among low-income women, WTP varied significantly by ethnicity and it was suggested that WTP studies that do not account for ethnic differences may be overstating net benefits to society (Wagner *et al.*, 2001). However, this was not confirmed by this study.

The mean WTP value for the public group (Table 4) was €5230 (95 per cent CI €4209–6250) and for the patient group €7996 (95 per cent CI €1889–9349). As the data were not normally distributed, the median values are also shown.

All subjects. The 'all subjects' model was the most important analysis in this study as all patients and members of the general public were included and this determined factors influencing WTP from users and non-users of the source (Table 2). This consequently gave a realistic and accurate valuation of the intervention. Multiple linear regression analysis showed only one significant finding and that was if the subject was in the patient or public group ($P = 0.009$). It has been suggested that individuals who are experiencing a particular health state would give higher WTP values than those not experiencing it (Sackett and Torrance, 1978). Therefore, an increased WTP value with increased need for treatment may be anticipated, and indeed, patients were prepared to pay €2750 more than the public group.

Public and pre-surgery group. When the public and pre-surgery group data were analysed together, no significant difference was found for WTP. Another variable examined was to establish whether the subject was in the public or the patient group. This differs from the comparison between the public and all patients (see previous section). This may be because the post-surgery subjects were willing to pay more than pre-surgery patients and their values have 'skewed' the overall mean patient value. However, this difference between pre- and post-surgery WTP values was not significant.

Quality of life (social aspects domain) significantly influenced WTP (Table 2). Respondents were willing to pay €117 more to improve their quality of life by one point on the social aspects domain (score range 0–32). This may reflect the lack of self-confidence and social skills that many orthognathic patients present with prior to surgery and the desire to achieve an improvement in these areas. Interestingly, when the patient group was analysed alone (see later), although social aspects was entered into the model, this was not found to be a significant factor affecting WTP. It would, therefore, appear that the public group also recognized these issues when the process of orthognathic treatment was explained to them. In addition, the disparity may be a reflection of the sample size.

Public group. The Townsend score did not significantly affect WTP when included in the multiple linear regression in the public group, although the *P*-value was relatively close to significance (Table 2; $P = 0.068$). It may be that ability to pay has some influence on WTP but that the Townsend score is not sufficiently sensitive. All of the measures that contribute to the Townsend score (car ownership, home ownership, overcrowding, and unemployment) can vary considerably within discrete geographical areas but still give the same Townsend score, thus leading to a less accurate representation of an individual's ability to pay. To measure ability to pay accurately, one would require the subject's income. This is very difficult to obtain as many subjects are unwilling to divulge such information. Many of the subjects were also students with a very low income, which further complicates the issue. However, the Townsend score has been used in many studies and, while acknowledging its problems, it has been used as the 'next best thing' to actual income (Gilthorpe *et al.*, 1997; Cunningham and Hunt, 2000). It has been thought likely in the past that WTP is correlated with ability to pay (Thompson, 1986; Donaldson *et al.*, 1995b) and some recent WTP studies in dentistry have shown an association between ability to pay and WTP (Matthews *et al.*, 1999; Dixon and Shackley, 1999). However, Cunningham and Hunt (2000), in their pilot study on WTP for orthognathic treatment, found no influence between WTP and ability to pay, as in this study.

Patient group 1 (pre- and post-surgery). In the patient group (pre- and post-surgery), the multiple linear regression (Table 2) showed a significant relationship between incisor classification and WTP, with a significant difference between Class II division 1 and Class III patients ($P = 0.031$). Interestingly, Class II division 1 patients were willing to pay €3130 more than Class III patients. It is generally thought that a Class III profile appears to be more disfiguring and it has been suggested that a Class III profile produces unattractive lip positions and throat form (Ackerman and Proffit, 1997). It therefore follows that these patients may be willing to pay more to correct their facial deformity, but this assumption was not proven in the study. The findings do, however, compare well with those of Cochrane *et al.* (1997) who found that Class II profiles were generally perceived to be less attractive than Class I, Class III or long face profiles when assessed by both orthodontists and members of the general public.

In society, Class III profiles in females are sometimes perceived to be more disfiguring than in males, whereas Class II division 1 profiles may be perceived to be more of a problem for males. In view of this, the interaction between incisor relationship and gender was also investigated using an interaction variable. However, no significant relationship was shown, indicating that incisor relationship together with gender does not appear to be a factor that influences WTP.

It is of note that whether the patient was pre- or post-surgery did not significantly influence WTP.

Patient group 2 (pre-surgery only). When the pre-surgery group only was analysed, similar findings were noted. The pre-operative group also showed a significant relationship between WTP and Class II division 1 compared with Class III subjects (Table 2). Interestingly, in this group the Class II division 1 patients were prepared to pay €3349 more, an even higher value than in the combined patient group. Again, no significant relationship was found between WTP and the gender/malocclusion interaction variable.

Calculated resource use

The resources used in orthognathic treatment were calculated as accurately as possible using a 'bottom-up' approach (Table 5). This was a very time-consuming process and consequently only five subjects were selected. All subsequent comments on the data are merely an indication of resource use and should be treated with some caution. However, it is interesting that the costs compare well with a study in which costs were assessed for 25 patients (Cunningham *et al.*, 2003). In this study, the total stated resource use varied between a minimum of €3722 and a maximum of €8039 (calculated for the year April 1999 to April 2000). Resources were measured purely from a NHS perspective with no consideration given to costs borne by the patients and their families (e.g. income lost from time off work) or external costs. Costs that were included were staff time, hotel services, medical supplies, and consumables.

Of the five subjects, three were treated by specialist registrars, one by a fixed term training appointment, and one by a consultant. A specialist registrar, although costed at a lower hourly rate, will probably take longer to treat patients and require supervision by senior members of staff. This may have implications on orthodontic resource use as compared with other non-training units where patients may be treated solely by senior clinicians. However, Table 5 shows that the orthodontic resource used represented a relatively low proportion of the total cost.

This method of calculating resource use also allows complications, such as poor co-operation during orthodontic treatment, slow space closure/arch co-ordination, operation cancellations, and adverse operating procedures, to be accounted for. These issues would have an impact due to an increased number of orthodontic visits and subsequent use of materials, increased number of joint clinic visits and prolonged theatre time.

If a health care intervention is highly valued, the WTP value would be expected to be higher than the actual cost of the programme. The mean total resource use in this study (€6134) was lower than the mean WTP value given by the patient group (€7996). Therefore, the intervention is highly valued by patients. The mean WTP values given by the public group (€5230) and the patient/public group combined (€6429) were also similar to the mean total calculated resource use (€6134). It may be that members of the public are able to value a programme more objectively without the 'emotional' aspects, e.g. discomfort, psychological aspects, and everyday wear of fixed appliances, and this may go some way to explaining the difference between the groups.

Conclusions

This study showed that both patients and the general public are prepared to place a monetary value on the correction of dentofacial deformity and that this form of economic evaluation is a useful tool in monitoring health care in the UK.

There was a significant difference between the mean WTP values for the public and patient groups. In the regression analysis, for all respondents (public and all patients), whether the respondent was a patient or a member of the public significantly affected WTP. Patients were prepared to pay €2750 more than the public group. This may be anticipated, as those experiencing the health state in question often give higher WTP values.

Ability to pay (represented by the Townsend score) did not significantly affect WTP. However, it came close to significance in the public group. This may be due to the problematic use of the Townsend score in London, where diverse social groups may be seen within discrete geographical areas.

When patient groups 1 and 2 were analysed there was a significant relationship between incisor relationship and WTP. Class II division 1 patients were prepared to pay more than Class III patients.

The mean resource use was considerably lower than the mean patient WTP value and similar to the mean public WTP value. This suggests that, in terms of cost-benefit, orthognathic treatment appears to be providing value for money, particularly from a patient perspective.

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