Volume 11 • Number 7 • 2008
VALUE IN HEALTH

Willingness to Accept versus Willingness to Pay in a Discrete Choice Experiment

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ABSTRACT

Objectives: Our main objective was to compare willingness to accept (WTA) and willingness to pay (WTP) in a discrete choice experiment on hearing aid provision. Additionally, income effect and endowment effect were explored as possible explanations for the disparity between WTA and WTP, and the impact of using a WTA and/or WTP format to elicit monetary valuations on the net benefit of the new organization of hearing aid provision was examined.

Methods: Choice sets were based on five attributes: performer of the initial assessment; accuracy of the initial assessment; duration of the pathway; follow-up at the ear, nose, and throat specialist; and costs. Persons with hearing complaints randomly received a WTP (costs defined as extra payment) or WTA (costs defined as discount) version of the experiment. In the versions, except for the cost attribute, all choice sets were equal.

Results: The cost coefficient was statistically significantly higher in the WTP format. Marginal WTA was statistically significantly higher than marginal WTP for the attributes accuracy and follow-up. Disparity was higher in the high educational (as proxy for income) group. We did not find proof of an experience endowment effect. Implementing the new intervention would only be recommended when using WTP.

Conclusions: WTA exceeds WTP, also in a discrete choice experiment. As this affects monetary valuations, more research on when to use a payment or a discount in the cost attribute is needed before discrete choice results can be used in cost-benefit analyses.

Keywords: cost-benefit analysis, discrete choice experiment, health services economics, methodology, monetary valuation.

Introduction

Studies that directly measure monetary values have often found a disparity between a person's willingness to pay (WTP) for a good and his willingness to accept (WTA) compensation to forgo the same good [1,2]. The aim of our study was to examine whether this disparity also occurs when one indirectly measures monetary values in a discrete choice experiment.

Monetary valuations are often elicited using contingent valuation [3,4]. In contingent valuation studies, one directly asks respondents how much money they would be willing to pay or how much compensation they would request for a hypothetical intervention. The resulting WTP or WTA is a measure of how much the respondent values the intervention. Following Hicks [5], one can use either the concept of compensating variation or the concept of equivalent variation to measure monetary values. Compensating variation measures the amount of money that is required after the change to make a respondent's level of utility the same as before the change, while equivalent variation measures the amount of money that is required before the change, to make utility the same as it would be after the change. Within both these concepts, a distinction can be made between WTA (when compensation is required) and WTP (when a payment is required).

Numerous contingent valuation studies have found that WTA exceeds WTP [1,2], but in health care, this disparity has only been examined four times [6–9]. Several explanations for the disparity between WTA and WTP have been suggested [10]. Standard economic theory allows for two possible explanations, being an income effect and a lack of substitutes [11]. An income effect would occur because payment is constrained by income, while demand of compensation is not. A total lack of substitutes would make it impossible to compensate an individual for the removal of the good, and would therefore lead to extreme WTA values. Another possible explanation, advanced by psychologists instead of economists, is the endowment effect [12]. The endowment effect is closely related to loss aversion, and suggests that desirable goods are more valuable when they are part of one's endowment.

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10.1111/j.1524-4733.2008.00340.x

  1098-3015/08/1110 1110–1119

That is, persons value the loss of something they own or have experienced higher than the acquirement of the same thing when they do not have or have not experienced it. Other possible explanations are related to the difference between buyers and sellers, and are explained elsewhere [10].

In contingent valuation studies, a difference is made between persons who would gain utility from implementing the intervention (potential "gainers") and persons who would lose utility from implementing the intervention (potential "losers"). Potential gainers should be asked to state their maximum WTP for the intervention, while potential losers should be asked to state their minimum WTA for the intervention [13,14]. Nevertheless, it has also been advocated to always use WTP, as WTP results are judged to be more valid and more conservative [4,15].

An alternative method to elicit monetary valuations is discrete choice experimentation [16,17]. Discrete choice experiments are developed in mathematical psychology and marketing, and are increasingly used in health services research [17–19]. When a cost attribute is included in the experiment, the WTP or the WTA compensation for a unit change in an attribute can be calculated. Subsequently, each alternative set of change in the levels of the attributes can be given a monetary value, which allows for use in a cost-benefit analysis, where the costs of a program are compared to its monetary benefits [14]. Much of the appeal of discrete choice experimentation lays in that it enables us to understand the trade-offs between attributes. This can, for instance, provide valuable information for health-care workers deciding between alternative ways of the provision of a health-care commodity. Another advantage of discrete choice experimentation is that it does not directly ask respondents to express an amount of money, so strategic behavior or protest answers are less likely to occur [20].

Until now, to our knowledge, no publications have addressed the disparity between WTA and WTP in discrete choice experiments. As a result, lack of clarity exists on when to use WTA or WTP in discrete choice experimentation.

The main objective of our study was to examine whether using a WTA and a WTP format for the cost attribute in a discrete choice experiment elicits different preferences and monetary values. We examined this in a discrete choice experiment on transferring elements of hearing aid provision from the medical sector to private hearing aid dispensers. If we find a disparity between WTA and WTP, our second objective will be to explore whether two possible explanations for the disparity, being the income and endowment effect, influence the disparity between WTA and WTP in a discrete choice experiment. Our third objective will be to examine the effect of using a WTA format, a WTP format, and a WTA format for potential losers and a WTP format for potential gainers to elicit monetary values on the net benefit of the new organization of hearing aid provision.

Methods

Setting

Approximately 10% of the general population of Western countries is hearing impaired, and this prevalence heavily increases with age [21,22]. For most hearing-impaired persons, hearing aid fitting is an effective intervention [23,24]. In The Netherlands, persons with a hearing loss exceeding 35 dB, averaged over 1, 2, and 4 kHz in the better ear, are entitled to a reimbursement by their medical insurance. Generally, the hearing aid dispenser collects the reimbursement, and the patient is billed only for that part of the hearing aid price that exceeds the reimbursement, which is referred to as the out-of-pocket payment.

Given the aging of the population, the prevalence and, as a result, the health-care costs associated with hearing rehabilitation will continue to increase. Because of the increasing costs and anticipated shortage of ear, nose, and throat (ENT) specialists in the care for hearing-impaired persons, direct hearing aid provision by private hearing aid dispensers is currently under evaluation in The Netherlands, as well as in other countries in Europe. Besides issues of safety and efficiency, it is important to consider patient preferences regarding the organization of hearing aid provision. Direct hearing aid provision by private dispensers can be perceived as both favorable and unfavorable, depending on patients' individual preferences. In a previous study [25] we asked persons with hearing complaints to grade direct hearing aid provision and provision by referral. We found that 42% of the respondents preferred hearing aid provision by referral; 39% preferred direct hearing aid provision, and 18% graded them equally. As there are patients who prefer direct hearing aid provision as well as patients who prefer provision by referral, implementation of direct hearing aid provision will generate both gainers and losers. This makes the case of direct hearing aid provision especially suitable for examining the disparity between WTA and WTP.

Questionnaire Design

Twelve possible attributes of interest were identified by experts. Of these attributes, the five most important were identified by hearing-impaired persons (N = 21) in a preliminary survey, using five-point Likert scales. These were 1) the performer of the initial assessment to distinguish between persons in need of medical care (referred to as patients) and persons not in need of medical care (clients), 2) the accuracy of the initial assessment, 3) the duration of the total hearing aid

Table 1 Attributes and levels used for discrete choice experiment

Attributes	Levels			
Performer and accuracy of initial assessment	• ENT specialist at hospital	• Dispenser at practice, equally accurate	• Dispenser at practice, 10% less accurate	• Dispenser at practice, 20% less accurate
Duration of hearing aid provision	• 2 months	• 4 months	• 6 months	• 8 months
Follow-up at ENT specialist	• Yes	• No		
Discount for WTA/extra payment for WTP	• No	• €20	• €50	• €100

ENT, ear, nose, and throat; WTA, willingness to accept; WTP, willingness to pay.

provision, 4) the follow-up at the ENT specialist to evaluate the hearing aid, and 5) costs. Realistic levels, based on the results of a previous study [26], were assigned to each attribute (Table 1). As we assumed the private dispenser to be equally or less accurate than the ENT specialist, the attributes performer and accuracy of the initial assessment had levels that could not logically be varied independently from each other. Following Louviere et al. [19], these attributes were combined. The cost attribute was assigned four levels, equal to two other attributes, to minimize an attribute effect. The range of the cost attribute was based on the answers on an open-ended question in the preliminary survey, and the levels were based on actual euro notes.

We used a fractional factorial design to reduce the number of choices to the smallest number necessary for an efficient design. Using the SPSS (SPSS, Chicago, IL) orthoplan procedure, we created an orthogonal main effect plan of the four attributes (three attributes with four levels and one attribute with two levels), which ensured both level balance and orthogonality. Subsequently, 16 choice pairs were determined using the "shifting" method, recommended by Street et al. [27], ensuring level balance, minimal overlap, and orthogonality. In the questionnaire, the respondents were asked to choose their preferred alternative from each choice pair, and we included the option that they found the alternatives equally attractive (no preference).

We created two versions of the questionnaire. In one version, the cost attribute was defined as an extra payment to be paid by the participants (WTP format) on top of their out-of-pocket payment for the hearing aid. In the other version, the cost attribute was defined as a discount off the out-of-pocket payment for the hearing aid (WTA format). By framing the cost attribute in relation to the out-of-pocket payment, we tried to make it as realistic as possible. The respondents were explicitly told that when they had no out-of-pocket payment for their hearing aid, the discount would be handed to them in cash in the WTA format, or they still had to pay the extra payment in the WTP format. As the difference between the attribute levels of two alternatives in a choice set is used as explanatory variable in the analysis, for each choice set, the increment in the cost attribute was equal in the two versions. An example of a discrete choice question is given in Table 2. This means that when in the WTP format, the extra payment was €20 higher for alternative B than for alternative A; in the WTA version, the discount was €20 lower for alternative B than for alternative A. This resulted in an increment of €20 in both formats. Apart from the cost attribute, all choice sets were equal in the WTA and WTP version of the questionnaire.

Additionally, we defined a choice set in which one alternative with a lower extra payment (or a higher discount), higher accuracy, and all other attribute levels equal unquestionably dominated the other, to check whether respondents understood the experiment. The total questionnaire therefore consisted of 17 discrete choice questions.

Survey Procedure

In a pilot study, it was examined whether the participants found all attributes important and whether they were willing to trade between the attributes, to check whether the chosen attributes and levels were appropriate. It was also examined whether the formulation was correct, and whether the participants understood the experiment. The pilot questionnaire, completed by

Table 2 Example of a discrete choice question

Attribute	Alternative A	Alternative B
Performer and accuracy of the initial assessment	ENT specialist at hospital	Dispenser at practice, equally accurate
Duration of hearing aid provision	2 months	4 months
Follow-up at ENT specialist	Follow-up at ENT specialist	No follow-up at ENT specialist
Extra payment/discount*	€20/€50	€50/€20
Which alternative would you choose?	☐ A	☐ B
	☐ I have no preference	

*Dependent on format: extra payment was used in the willingness to pay format; a discount was used in the willingness to accept format.
ENT, ear, nose, and throat.

35 participants, was administered face to face by a trained interviewer at a private dispenser practice. Based on the results of the pilot study, we slightly adjusted the range of the duration attribute. Following the pilot study, two trained interviewers conducted face-to-face interviews at four private hearing aid dispenser practices, chosen to be representative for the region. Participants were persons with hearing complaints visiting the dispenser. The WTA and WTP versions were randomly conducted by both interviewers and were randomly assigned to the respondents in all four practices.

Statistical Analysis

We used a random effects ordered probit model to analyze the data, with choice (A, no preference, or B) as the ordinal dependent variable [28]. Explanatory variables were the differences between the levels of the two alternatives.

For the first objective, to examine whether a WTA and WTP format elicits different preferences and monetary values, for each format a regression model was estimated. Before the regression models were estimated, we examined whether preferences were influenced by participants' characteristics (age, sex, experience with hearing aid provision, and income). We included each interaction term in the main attribute model separately, and subsequently included all interaction terms with a statistically significant regression coefficient in the model simultaneously; for all analyses, a *P*-value smaller than 0.05 was considered statistically significant. A stepwise backward procedure was used, and interaction terms with the highest *P*-value (>0.05) were excluded from the model one at a time. In the presence of interaction, the coefficients of the attributes will be dependent on patient characteristics. Differences in the distributions of these characteristics between the groups will therefore influence the comparison of WTA and WTP. To avoid this influence, we estimated the models for a group with median characteristics of the total group. The monetary valuation of each attribute was calculated by dividing the regression coefficient of each attribute by the regression coefficient of the cost attribute. This resulted in the marginal WTP or to accept compensation for a change in the level of a certain attribute. As the marginal WTA or WTP is the amount of money that would be required after the change to make one's utility level the same as before the change, we used the concept of compensating variation. Confidence intervals for WTA and WTP were calculated using the delta method [29].

For the second objective, to explore whether an income or endowment effect influences the disparity between WTA and WTP, we first examined the disparity for a low-income group (below median income) versus a high-income group (median income or higher). We used the ratio between WTA and WTP as an indicator for the disparity. We hypothesized that, because WTP is constrained by income whereas WTA is not, the disparity between WTA and WTP would be higher in the low-income group as opposed to the high-income group. Next, we explored the influence of initial endowments of experience. We examined whether the disparity between WTA and WTP was influenced by the fact that persons had previously experienced hearing aid provision. Previous studies have found that once individuals have experienced something, it becomes part of their endowment, and they value it more highly than persons who have not experienced it [30–32]. We therefore hypothesized that in respondents who had experienced hearing aid provision, the disparity between WTA and WTP would be higher than in respondents without experience.

With respect to the third objective, we examined the effect of using a WTA format, a WTP format, and a WTA format for losers and a WTP format for gainers to obtain monetary valuation on the net benefit of a new intervention. For this objective, losers were respondents who potentially lose utility from implementing the intervention, while gainers were respondents who potentially gain utility from implementing the new intervention. The new, and currently recommended, intervention has all attributes equal to the current organization of hearing aid provision, except for omitting the follow-up at the ENT specialist [26]. With individual regression analyses, we checked for each respondent whether he or she preferred the follow-up at the ENT specialist or not. Respondents who preferred the follow-up at the ENT specialist were defined as losers from the new intervention, while respondents who preferred no follow-up at ENT were defined as gainers. First, we calculated the monetary value for the new intervention using the WTA format. Next, we calculated the monetary value for the new intervention using the WTP format. Third, we calculated the weighted average of the monetary values of the losers in the WTA format and the gainers in the WTP format. To examine the impact of the three different approaches on the net benefit, we subtracted the incremental costs of the new intervention from the incremental benefits. We used the costs of one ENT consultation (€104) as an estimate of the cost reduction as a result of the implementation of the new intervention [33]. Data were managed in SPSS 12.0.1 (SPSS) and analyzed using STATA 9 (StataCorp LP, College Station, TX).

Results

Respondents

Between August and December 2006, 402 persons were invited to participate in the survey. Of them, 300 (75%) agreed to be interviewed. Both versions of the questionnaire were completed by 150 participants each. Nine participants (3%) did not answer the

Table 3 Characteristics of participants for each format and for the total group of participants

Characteristic	WTA format (N = 146)	WTP format (N = 145)	Total (N = 291)
Age (years)			
Mean (SD)	71.0 (10.7)	67.6 (13.1)	69.3 (12.0)
Median (range)	72.4* (18–95)	69.4* (19–92)	71.3 (18–95)
Male	85 (58%)	83 (57%)	168 (58%)
Education			
No education	2 (1%)	2 (1%)	4 (1%)
Primary school	35 (24%)	26 (18%)	61 (21%)
Lower education	32 (22%)	36 (25%)	68 (23%)
Junior general secondary education	29 (20%)	23 (16%)	52 (18%)
Senior secondary vocational education	15 (10%)	18 (12%)	33 (11%)
Senior general secondary education	13 (9%)	10 (7%)	23 (8%)
Higher professional education	14 (10%)	25 (17%)	39 (13%)
University	6 (4%)	5 (3%)	11 (4%)
Family income per month			
€450–1100	18 (12%)	13 (9%)	31 (11%)
€1100–1600	28 (19%)	30 (21%)	58 (20%)
€1600–2000	21 (14%)	12 (8%)	33 (11%)
€2000–3000	23 (16%)	24 (17%)	47 (16%)
>€3000	16 (11%)	16 (11%)	32 (11%)
Do not know	14 (10%)	11 (8%)	25 (9%)
Not willing to answer	26 (18%)	39 (27%)	65 (22%)
Previously experienced hearing aid provision	96 (66%)	88 (61%)	184 (63%)
Out-of-pocket payment for the hearing aid (€)			
Median (SD)	839 (907)	911 (985)	875 (944)
Median (range)	605 (0–5000)	775 (0–6000)	735 (0–6000)

Values are numbers (percentages) unless stated otherwise.
*Statistically significantly different: Mann–Whitney *U*-test, $P < 0.05$.
WTA, willingness to accept; WTP, willingness to pay.

dominant pair correctly and were therefore excluded from the analysis. Table 3 shows the characteristics of the participants. Completers of the WTA questionnaire had a median age of 72 years (range 18–95), while completers of the WTP questionnaire had a median age of 68 years (range 19–92). This difference was statistically significant (Mann–Whitney *U*-test, *P*-value 0.02). Although slightly different, the out-of-pocket payments for the hearing aid were not statistically significantly different between the groups (Mann–Whitney *U*-test, *P*-value 0.746). Also, for the other characteristics, there were no statistically significant differences between the groups.

There were 31% missing values on family income (Table 3). Missing value imputation by using the regression method resulted in a large standard error. As we expected these missing values not to be random but to occur more often in persons with higher income, we decided not to use income in the analyses. Alternatively, we used the participant's educational level as a proxy for income, as educational level was correlated with income (Spearman's rho 0.55, *P*-value < 0.0001), and had no missing values.

WTA versus WTP

The final sample for analysis consisted of 291 participants, resulting in 4656 choice observations, equally divided over the two formats (WTA 2336, WTP 2320). Table 4 shows the final regression models for both formats. The signs and weights of the coefficients did not differ between the models, except for the cost attribute (*P*-value < 0.0001). The coefficients were all statistically significantly different from zero, except for the attribute regarding the initial assessment at the dispenser in the WTP format.

Next, we compared marginal WTA and WTP (Table 4). The participants preferred the initial assessment at a private dispenser. In the WTA format, the monetary valuation for the initial assessment at a private dispenser was 3.2 times higher than in the WTP format (*P*-value 0.21). In the WTA format, a 10% increase in accuracy was valued 3.0 times higher than in the WTP format (*P*-value 0.01). Regarding duration, the WTA format elicited a 1.7 times higher monetary value for 2 months shorter duration than the WTP format (*P*-value 0.47). The WTA format elicited a monetary value for the follow-up at the ENT specialist that was 3.0 times higher than in the WTP format (*P*-value 0.005).

Exploring Possible Explanations

We found an education effect, but in the opposite direction of what we hypothesized. The disparity between WTA and WTP was higher in the high educational group (Table 5a). This was due to the fact that an education effect only occurred in the WTA format, where the participants with a higher educational level found the discount considerably, and statistically significantly, less important than the participants with a lower educational level.

Table 4 Results of the random effects ordered probit regression for both the WTA and WTP formats

	WTA format			WTP format			
Attribute	Regression coefficient	(95% CI)	WTA¶	Regression coefficient	(95% CI)	WTP¶	Ratio WTA/WTP
Initial assessment at dispenser†	0.102	(0.01–0.19)	–€50	0.081	(–0.01–0.17)	€15	3.2
10% gain in accuracy‡	0.242	(0.19–0.30)	–€119*	0.207	(0.16–0.26)	€39*	3.0
2 months shorter duration‡	0.033	(0.00–0.06)	–€16	0.051	(0.02–0.08)	€10	1.7
No follow-up at ENT specialist†	–0.463	(–0.52 to –0.41)	€227*	–0.405	(–0.46 to –0.35)	–€77*	3.0
Higher discount/payment§	0.002	(0.001–0.003)	n.a.	–0.005	(–0.006 to –0.004)	n.a.	

Based on a group with median age (71.3 years), median educational level (junior general secondary education), mean proportion of males (58%), and mean proportion of persons who have experienced hearing aid provision (63%); calculations are based on nonrounded figures.

*Difference between the marginal WTA and WTP values is statistically significant; $P = 0.01$.

†Dummy coding with 0 = no and 1 = yes.

‡Continuous coding in correspondence with the chosen levels (initial assessment accuracy per 10%, duration of the hearing aid provision per 2 months).

§Discount in the WTA format, payment in the WTP format; continuous coding in Euro.

¶Please note that the marginal WTP or WTA values are only illustrative if regression coefficients are not statistically significantly different from zero.

CI, confidence interval; ENT, ear, nose, and throat; n.a., not applicable; WTA, willingness to accept; WTP, willingness to pay.

We did not find that the disparity between WTA and WTP was higher in persons with experience than in those without experience with hearing aid provision (Table 5b). It was inconclusive which group overall showed a higher disparity, as the disparity varied across the attributes. We did find that experienced respondents preferred the initial assessment at the dispenser, while respondents who were inexperienced had no statistically significant preference.

Effect of Different Formats on the Net Benefit

When using the WTA format, the monetary valuation of the new intervention amounts to –€227 (Table 6).

Use of the WTP format resulted in a monetary valuation of –€77 for the new intervention. Third, when the WTA format was used for potential losers (N = 118) and the WTP format for potential gainers (N = 24), monetary values were €76 for the gainers versus –€414 for the losers. This resulted in a weighted average of –€331 for the new intervention. All three approaches resulted in a negative benefit for the new intervention.

Given the cost reduction of €104, this would result in a monetary net benefit of €27 when using only the WTP format. As this was a positive net benefit, based on the WTP results, one would recommend implementation of the new intervention. The other two approaches would result in a negative net benefit (–€123 and –€227, respectively), based on which one would recommend not to implement the new intervention.

Discussion

This study compares WTA and WTP in a discrete choice experiment. We found the cost attribute to have a statistically significantly higher regression coefficient when it was defined as extra payment compared to a discount. Marginal WTA was statistically significantly higher than WTP for both accuracy and the follow-up at the ENT specialist. In contrast to our expectations, the disparity between WTA and WTP was higher in a high educational group compared with a low educational group. We found that persons with a higher educational level found a discount less important than those with a lower educational level. Respondents who had experienced hearing aid provision did not have a higher disparity between WTA and WTP than those without experience. Implementing the new intervention would only be recommended when using a WTP format to elicit monetary valuations, and would not be recommended when using a WTA format for losers and a WTP format for gainers or only a WTA format.

The fact that we found a disparity between WTA and WTP is not surprising, as it is indisputable that a disparity between WTA and WTP exists [1,10]. In their review, Horowitz and McConnell [1] found WTA/WTP ratios ranging from 1 to 113, with a mean ratio of 7. In health care, these ratios range from 1 to 6.4

Table 5 Regression models to explore (a) an income effect and (b) an experience endowment effect on the disparity between WTA and WTP

	WTA format			WTP format			
	Regression coefficient	(95% CI)	WTA[¶]	Regression coefficient	(95% CI)	WTP[¶]	Ratio WTA/WTP
a. Education as a proxy for income							
Low educational level	(N = 69)			(N = 64)			
Initial assessment at dispenser[‡]	0.044*	(−0.09–0.18)	−€13	0.058	(−0.08–0.20)	€11	1.2
10% gain in accuracy[‡]	0.212	(0.14–0.29)	−€65	0.185	(0.11–0.26)	€35	1.8
2 months shorter duration[‡]	0.032	(−0.01–0.08)	−€10	0.024	(−0.02–0.07)	€5	2.1
No follow-up at ENT specialist[‡]	−0.375*	(−0.45 to −0.30)	€114	−0.384*	(−0.46 to −0.30)	−€73	1.6
Higher discount/payment[§]	0.003*	(0.002–0.005)	n.a.	−0.005	(−0.007 to −0.004)	n.a.	
High educational level	(N = 77)			(N = 81)			
Initial assessment at dispenser[‡]	0.240*	(0.11–0.38)	−€265	0.102	(−0.02–0.23)	€19	13.7
10% gain in accuracy[‡]	0.278	(0.20–0.35)	−€307	0.231	(0.16–0.30)	€44	7.0
2 months shorter duration[‡]	0.036	(−0.01–0.08)	−€40	0.030	(−0.02–0.08)	€6	7.0
No follow-up at ENT specialist[†]	−0.504*	(−0.58 to −0.42)	€557	−0.511*	(−0.59 to −0.43)	−€97	5.7
Higher discount/payment[§]	0.001*	(0.000–0.002)	n.a.	−0.005	(−0.007 to −0.004)	n.a.	
b. Experience endowment							
No experience	(N = 50)			(N = 57)			
Initial assessment at dispenser[‡]	−0.029*	(−0.19–0.13)	€17	0.010	(−0.14–0.16)	€2	n.c.
10% gain in accuracy[‡]	0.275	(0.18–0.37)	−€163	0.215	(0.13–0.30)	€42	3.9
2 months shorter duration[‡]	0.024	(−0.03–0.08)	−€14	0.055	(0.00–0.11)	€11	1.3
No follow-up at ENT specialist[†]	−0.464	(−0.56 to −0.37)	€275	−0.421	(−0.51 to −0.33)	−€83	3.3
Higher discount/payment[§]	0.002	(0.000–0.003)	n.a.	−0.005	(−0.007 to −0.004)	n.a.	
Experience	(N = 96)			(N = 88)			
Initial assessment at dispenser[‡]	0.222*	(0.10–0.34)	−€103	0.131	(0.01–0.25)	€24	4.2
10% gain in accuracy[‡]	0.229	(0.16–0.29)	−€106	0.208	(0.14–0.28)	€39	2.7
2 months shorter duration[‡]	0.038	(0.00–0.08)	−€18	0.022	(−0.02–0.06)	€4	4.2
No follow-up at ENT specialist[†]	−0.431	(−0.50 to −0.36)	€200	−0.472	(−0.54 to −0.40)	−€88	2.3
Higher discount/payment[§]	0.002	(0.001–0.003)	n.a.	−0.005	(−0.007 to −0.004)	n.a.	

Based on a group with median age (71.3 years), median educational level (junior general secondary education), mean proportion of males (58%), and mean proportion of persons who have experienced hearing aid provision (63%), except when comparing groups based on these characteristics; calculations are based on nonrounded figures.
*Difference between the two groups is statistically significant; *P*-value < 0.05.
[†]Dummy coding with 0 = no and 1 = yes.
[‡]Continuous coding in correspondence with the chosen levels (initial assessment accuracy per 10%, duration of the hearing aid provision per 2 months).
[§]Discount in the WTA format, payment in the WTP format; continuous coding in euro.
[¶]Please note that the marginal WTA or WTP values are only illustrative if regression coefficients are not statistically significantly different from zero.
CI, confidence interval; ENT, ear, nose, and throat; n.a., not applicable; n.c., not calculated; WTA, willingness to accept; WTP, willingness to pay.

Table 6 Monetary valuation of the new intervention, elicited with a WTA format, WTP format, and WTA format for losers and WTP format for gainers, and net benefit

Format	N	Monetary valuation	(95% CI)	Weighted average	Net benefit*
1. WTA	146	–€227	(–€332 to –€123)		–€123
2. WTP	145	–€77	(–€93 to –€61)		€27
3. WTA for losers	118	–€414	(–€686 to –€143)	–€331	–€227
WTP for gainers	24	€76	(€32 to €119)		

*Net benefit is based on a cost reduction of €104.
Based on a group with median age (71.3 years), median educational level (junior general secondary education), mean proportion of males (58%), and mean proportion of persons who have experienced hearing aid provision (63%).
CI, confidence interval; WTA, willingness to accept; WTP, willingness to pay.

[6–9]. The disparity found in this discrete choice experiment is within this range of disparities found in health-care contingent valuation studies.

Income is thought to influence the disparity between WTA and WTP, as WTP is constrained by income, whereas WTA is not [10]. In our study, we did not find a higher disparity in a low educational group as opposed to a high educational group. Extra payment was found to be equally important in both groups. Possibly, the €100 range of extra payment we used was not large enough to reach the budget constraint in the low educational group. Nevertheless, an education effect was found only in the WTA format, where the group with higher education clearly found the discount less important than the group with lower education. The fact that persons with higher education (and hence higher income) value a certain amount of money lower than persons with lower income is not surprising. We, however, expected to observe this in the WTP format as well, resulting in no influence of educational level on the disparity between WTA and WTP.

Most of the explanations for the disparity between WTA and WTP relate to the difference between buyers who gain a good (in the WTP format) and sellers who lose a good (in the WTA format). These explanations may, however, only apply to discrete choice experimentation when each choice set consists of the status quo and an alternative scenario. In the present discrete choice experiment, we did not use a status quo design. Also, we did not label the scenarios, and scenarios were equal in both formats except for the cost attribute. By doing this, we minimized status quo bias and loss aversion [34]. We found no evidence of an experience endowment effect. For one attribute, the initial assessment, we found that respondents without experience showed a stronger preference for the real-world status quo (initial assessment at ENT specialist) compared with those with experience. Probably, persons who have already experienced a medical examination for their hearing problems attached less value to consulting a medical specialist for the initial assessment again. Although it was not the focus of our analysis, when calculating the WTA for potential losers of the new intervention, we found that the WTA for losers was higher than the WTA for the total group (Table 6). This result may suggest the presence of loss aversion. The loss aversion may not be directly related to what persons had or had experienced, and thus to endowment or property rights, but may be more related to their attitude toward the new intervention. Possibly, loss aversion was based more on an intrinsic feeling of loss than on actual losses.

There are some limitations of the present study. First, although our study population was sufficiently large for the main analysis on the disparity between WTA and WTP, the study population was relatively small for exploring income and endowment effect as explanations of the disparity. Because we had to split both samples in two to compare different groups, we found regression coefficients with large standard errors that were not significantly different from zero. Nevertheless, as our second objective was exploratory, we decided to show the results and focus on the ratio between WTA and WTP rather than to draw conclusions only on statistically significantly different results. Another limitation of the present study is that we had no information beforehand on whether the participants would gain or lose utility when implementing the new organization of hearing aid provision. It would be interesting to assign the WTA or WTP questionnaire depending on whether participants are gainers or losers. Nevertheless, because our main objective was to examine whether monetary valuations differ when using a WTA compared with a WTP format, we feared that asking preferences beforehand would influence the results of the discrete choice experiment, as respondents would possibly be more inclined to choose the status quo. Finally, a potential limitation is that we were forced to use educational level as a proxy for income, because of the large number of missing values on income. We additionally performed the analyses of income effect with income to check whether educational level was a valid proxy, and found a similar but stronger effect (results not presented).

The present study has some important implications. First, defining the cost attribute in a discrete choice experiment as a discount or payment changes monetary valuations. When using monetary valuation from a discrete choice experiment in a cost-benefit analysis, as shown in the present study, this may even alter

policy recommendations. Whether differences between preferences should be incorporated in decision-making has also been discussed by O'Brien et al. [2], Severens et al. [35], and Dowie [36,37]. As patient preferences gain increasing attention in decision making [16], and patients have preferences over aspects of health care beyond health-related quality of life, discrete choice experiments will probably become increasingly important in health services research. Most discrete choice experiments in health care use the concept of WTP, but WTA has also been used [38–40]. Although in other articles it was stated that the inclusion of a cost attribute to elicit monetary valuations with discrete choice experiments should be done with caution [41–44], to our knowledge, no study has paid explicit attention to when the cost attribute should be defined as a payment or a discount. The lack of clarity on how to address the disparity between WTA and WTP in discrete choice experiments probably results from the fact that before the present study, the disparity had not yet been examined and, as a result, had not yet been found in discrete choice experiments.

One can address the disparity between WTA and WTP by asking participants beforehand whether they prefer the program that is under evaluation, and assign the WTA or WTP version of the discrete choice experiment accordingly. This would, however, require the use of a status quo scenario in each choice set [41], which would possibly introduce status quo bias [34]. More importantly, a great advantage of a discrete choice experiment is its flexibility that monetary values can be calculated for any configuration of attributes and levels [41]. As gainers for one configuration can be losers for another, when eliciting WTP from gainers and WTA from losers, one can only calculate the monetary valuation of the interventions where this distinction between gainers and losers holds, which decreases this flexibility.

It has been stated that WTP is preferred over WTA in contingent valuation studies [4,15], because WTP is said to be more valid and more conservative than WTA [15]. In the present study, however, the WTP for the new intervention resulted in a negative WTP. This indicates that for the new intervention, the use of a WTA format may have been more appropriate. The net benefit analyses showed that if the new intervention would lead to a cost reduction of €104, implementation of the intervention would only be recommended when the monetary valuation was elicited in the WTP format. This clearly illustrates that using a WTA format is more conservative when the majority of respondents are losers.

Conclusions

The results of this discrete choice experiment confirm that WTA exceeds WTP. This has consequences when using the discrete choice results in a cost-benefit analysis. It is therefore important that there is consensus on when to define the cost attribute in a discrete choice experiment as a payment or a discount. For now, the best option seems to be to choose the most conservative format, which is WTP if (the majority of) respondents are potential gainers, and WTA if (the majority of) respondents are potential losers. Nevertheless, as stated, this may affect the flexibility of discrete choice experiments to calculate monetary values for different configurations of interest within a cost-benefit analysis.

Now that we have demonstrated that the disparity between WTA and WTP also occurs in discrete choice experiments, more research on when to use a payment or a discount is needed before monetary values based on discrete choice experiments can be used in cost-benefit analyses.

We thank Judy Kuipers-Janssen and Jolien Hendrikx for conducting the interviews, and all employees of Beter Horen Maastricht, Hans Anders Maastricht and Streukens Hoorapparaten BV Heerlen and Maastricht for their cooperation. The helpful comments of Hans Severens and two anonymous reviewers are greatly acknowledged.

Source of financial support: Financial support from the Heinsius Houbolt Foundation is greatly acknowledged.

Supplementary material for this manuscript can be found at http://www.ispor.org/publications/value/ViHsupplementary.asp

References

1 Horowitz JK, McConnell KE. A review of WTA/WTP studies. J Environ Econ Manage 2002;443:426–47.
2 O'Brien BJ, Gertsen K, Willan AR, et al. Is there a kink in consumers' threshold value for cost-effectiveness in health care? Health Econ 2002;11:175–80.
3 Diener A, O'Brien B, Gafni A. Health care contingent valuation studies: a review and classification of the literature. Health Econ 1998;7:313–26.
4 Bayoumi AM. The measurement of contingent valuation for health economics. Pharmacoeconomics 2004; 22:691–700.
5 Hicks JR. The four conumer's surpluses. Rev Econ Studies 1943;11:31–41.
6 Carthy T, Chilton S, Covey J, et al. On the contingent valuation of safety and the safety of contingent valuation: part 2—the CV/SG "chained" approach. J Risk Uncertain 1999;17:187–213.
7 O'Brien BJ, Goeree R, Gafni A, et al. Assessing the value of a new pharmaceutical. A feasibility study of contingent valuation in managed care. Med Care 1998;36:370–84.
8 Borisova NN, Goodman AC. Measuring the value of time for methadone maintenance clients: willingness to pay, willingness to accept, and the wage rate. Health Econ 2003;12:323–34.

9 Van den Berg B, Bleichrodt H, Eeckhoudt L. The economic value of informal care: a study of informal caregivers' and patients' willingness to pay and willingness to accept for informal care. Health Econ 2005;14:363–76.
10 Brown TC, Gregory R. Why the WTA-WTP disparity matters. Ecol Econ 1999;283:323–35.
11 Hanemann WM. Willingness to pay and willingness to accept: how much can they differ? Am Econ Rev 1991;813:635–47.
12 Kahneman D, Tversky A. Prospect theory: an analysis of decision under risk. Econometrica 1979;472:263–91.
13 O'Brien B, Gafni A. When do the "dollars" make sense? Toward a conceptual framework for contingent valuation studies in health care. Med Decis Making 1996;16:288–99.
14 Drummond MF, Sculpher MJ, Torrance GW, et al. Methods for the Economic Evaluation of Health Care Programmes (3rd ed.). New York: Oxford University Press, 2005.
15 Arrow K, Solow R, Portney PR, et al. Report of the NOAA Panel on Contingent Valuation, 1993. Available from http://www.darrp.noaa.gov/library/pdf/cvblue.pdf [Accessed February 14, 2008].
16 Ryan M. Discrete choice experiments in health care. BMJ 2004;328:360–1.
17 Ryan M, Gerard K. Using discrete choice experiments to value health care programmes: current practice and future research reflections. Appl Health Econ Health Policy 2003;2:55–64.
18 Ryan M, Farrar S. Using conjoint analysis to elicit preferences for health care. BMJ 2000;320:1530–3.
19 Louviere JJ, Hensher DA, Swait JD. Stated Choice Methods: Analysis and Applications. Cambridge: Cambridge University Press, 2000.
20 Van den Berg B, Al M, Brouwer W, et al. Economic valuation of informal care: the conjoint measurement method applied to informal caregiving. Soc Sci Med 2005;61:1342–55.
21 Chorus AMJ, Kremer A, Oortwijn WJ, et al. Hearing impairment in the Netherlands (in Dutch). Leiden: TNO Preventie en Gezondheid, 1995.
22 Davis AC. Hearing in Adults. London: Whurr Publishers Ltd., 1995.
23 Mulrow CD, Aguilar C, Endicott JE, et al. Quality of life changes and hearing impairment. Ann Intern Med 1990;113:188–94.
24 Larson VD, Williams DW, Henderson WG, et al. Efficacy of 3 commonly used hearing aid circuits: a crossover trial. NIDCD/VA Hearing Aid Clinical Trial Group. JAMA 2000;284:1806–13.
25 Grutters JP, van der Horst F, Joore MA, et al. Potential barriers and facilitators for implementation of an integrated care pathway for hearing-impaired persons: an exploratory survey among patients and professionals. BMC Health Serv Res 2007;7:57.
26 AZOS Working Group. Final report AZOS (in Dutch). Diemen: Health Care Insurance Board, 2006. Available from: http://www.nvvs.nl/download/AZOS.eindrapport.mrt2006.pdf [Accessed February 14, 2008].
27 Street DJ, Burgess L, Louviere JJ. Quick and easy choice sets: constructing optimal and nearly optimal stated choice experiments. Int J Res Mark 2005;22:459–70.
28 Train KE. Discrete Choice Methods with Simulation. Cambridge: University Press, 2003.
29 Hanemann WM, Kanninen B. The Statistical Analysis of Discrete-Response CV Data. Berkeley: Department of Agricultural and Resource Economics and Policy, 1998.
30 Porter M, Macintyre S. What is, must be best: a research note on conservative or deferential responses to antenatal care provision. Soc Sci Med 1984;19:1197–200.
31 Ryan M, McIntosh E, Shackley P. Methodological issues in the application of conjoint analysis in health care. Health Econ 1998;7:373–8.
32 Ryan M, Ubach C. Testing for an Experience Endowment Effect in Health Care. Appl Econ Lett 2003;107:407–10.
33 Oostenbrink JB, Koopmanschap MA, Rutten FFH. Manual for Costing Research (in Dutch). Amstelveen: College voor zorgverzekeringen, 2004.
34 Salkeld G, Ryan M, Short L. The veil of experience: do consumers prefer what they know best? Health Econ 2000;9:267–70.
35 Severens JL, Brunenberg DE, Fenwick EA, et al. Cost-effectiveness acceptability curves and a reluctance to lose. Pharmacoeconomics 2005;23:1207–14.
36 Dowie J. Why cost-effectiveness should trump (clinical) effectiveness: the ethical economics of the South West quadrant. Health Econ 2004;13:453–9.
37 Dowie J. No room for kinkiness in a public healthcare system. Pharmacoeconomics 2005;23:1203–5.
38 Telser H, Zweifel P. A new role for consumers' preferences in the provision of health care. Econ Affairs 2006;26:4–9.
39 Ubach C, Scott A, French F, et al. What do hospital consultants value about their jobs? A discrete choice experiment BMJ 2003;326:1432.
40 Van der Pol M, Cairns J. Establishing patient preferences for blood transfusion support: an application of conjoint analysis. J Health Serv Res Policy 1998;3:70–6.
41 McIntosh E. Using discrete choice experiments within a cost-benefit analysis framework: some considerations. Pharmacoeconomics 2006;24:855–68.
42 Ratcliffe J. The use of conjoint analysis to elicit willingness-to-pay values. Proceed with caution? Int J Technol Assess Health Care 2000;16:270–5.
43 Slothuus Skjoldborg U, Gyrd-Hansen D. Conjoint analysis. The cost variable: an Achilles' heel? Health Econ 2003;12:479–91.
44 Hanley N, Ryan M, Wright R. Estimating the monetary value of health care: lessons from environmental economics. Health Econ 2003;121:3–16.