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**GATE Groupe d'Analyse et de Théorie Économique Lyon-St Étienne**

93, chemin des Mouilles 69130 Ecully – France

Tel. +33 (0)4 72 86 60 60

Fax +33 (0)4 72 86 60 90

6, rue Basse des Rives 42023 Saint-Etienne cedex 02 – France

Tel. +33 (0)4 77 42 19 60

Fax. +33 (0)4 77 42 19 50

Messagerie électronique / Email : [gate@gate.cnrs.fr](mailto:gate@gate.cnrs.fr)

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# The information content of the WTP-WTA gap: An empirical analysis among severely ill patients

Nathalie HAVET<sup>a</sup>, Magali MORELLE<sup>b</sup>, Alexis PENOT<sup>c</sup>, Raphaël REMONNAY<sup>d</sup>

## Abstract:

Large disparities between willingness to pay (WTP) and willingness-to-accept (WTA) are commonly encountered in empirical studies and raise some important controversies. Nevertheless, the relationships between WTA and WTP can help understand not only how a service is valued but also how it can be substituted or how its loss can be resisted. The purpose of this study was to examine cancer patients' preferences for blood transfusion setting from the perspective of WTA and WTP. A contingent valuation (CV) survey was administered to 139 patients receiving transfusions either at home or in the hospital. While few patients (6%) gave WTP protest responses, the WTA approach generated more protest responses (18%). The WTA-WTP discrepancy was confirmed. One in four of the patients reported that no amount was deemed sufficient to compensate for the renunciation of their home BT management. The main determinants of WTP were significantly different from WTA predictors. Our results suggest that individuals' strategies towards constructing WTP and WTA differ in terms of determinants, reasoning, use of information and economic rationality. They give empirical evidence on the usefulness to elicit both WTP and WTA responses in health-surveys to help understand the economic evaluation of health technology assessment and care organization.

**Keywords:** Economic evaluation, Contingent valuation, Willingness-to-pay and willingness-to-accept divergence, Blood transfusion, Home care services, Oncology

**JEL Classification:** I1 (health), I3 (welfare), H41 (public good)

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<sup>a</sup> Université de Lyon, Lyon, F-69007, France ; CNRS, GATE Lyon St Etienne, Ecully, F-69130, France, Université Lyon 2, Lyon, F-69007, France. GATE: 93, Chemin des Mouilles, B.P. 167, 69131 Ecully, France. E-mail: havet@gate.cnrs.fr

<sup>b</sup> Université de Lyon, Lyon, F-69007, France ; CNRS, GATE Lyon St Etienne, Ecully, F-69130, France, Léon Bérard Comprehensive Cancer Center, Lyon, F-69003, France. CLB: 28, rue Laënnec, 6373 Lyon Cedex 08, France. E-mail: morelle@lyon.unicancer.fr

<sup>c</sup> Université de Lyon, Lyon, F-69007, France ; CNRS, GATE Lyon St Etienne, Ecully, F-69130, France, Ecole Normale Supérieure de Lyon, Lyon, F-69007, France. ENS Lyon : 15 parvis René Descartes, BP 7000, 69342 Lyon Cedex 7. Email: penot@gate.cnrs.fr

<sup>d</sup> Léon Bérard Comprehensive Cancer Center, Lyon, F-69007, France. Email: raphael\_remonnay@sfr.fr

## 1. Introduction

Valuing health care services the user receives in the national health system is quite complicated in the absence of any market. Contingent Valuation (CV), developed in the framework of cost-benefit analysis, is a particularly relevant method of determining benefits technology assessment when it comes to comparing two types of health care management which may differ in patients' well-being and satisfaction during the treatment process with no difference on health outcomes (Gerard & Mooney, 1993; Ryan & Shackley, 1995; Ryan, 1996; Donaldson & Shackley, 1997). CV values goods or services that cannot be exchanged in traditional markets by constructing a hypothetical but realistic scenario about the good or service in question. The value attributed by CV methodology can be studied from the perspective of willingness-to-pay (WTP) or by the willingness-to-accept compensation (WTA). In the WTP approach, potential beneficiaries receive descriptions of the expected consequence of the technology under appraisal, and are asked to elicit the maximum amount they would be willing to pay to ensure that this expected consequence occurred (Olsen, 1997). The WTA approach consists in asking actual users of the existing technology under appraisal to specify compensation for the hypothetical loss of their entitlement, for example if this technology is removed from the health care services. Individuals are also asked to elicit the minimum amount they would be willing to accept to make up for this loss. In most cases in health-related CV contexts, the WTP has been employed to assess the distribution of patients' preferences. Nevertheless, the standard economic theory assumed that WTA could be inferred from WTP, since it stated that the marginal amount an individual is willing-to-pay to obtain a good is approximately equal to the marginal amount the individual is willing-to-accept to relinquish the same good (Willig, 1976).

However, empirical studies, where WTP and WTA have been simultaneously estimated, show substantial evidence of a disparity between the two CV's approaches (O'Brien *et al.*, 1998; Plott & Zeiler, 2005; Sayman & Oncüler, 2005; van den Berg *et al.*, 2005; Whyne & Sach, 2007; Grutters

*et al.*, 2008, Martin-Fernandez *et al.*, 2010): the WTA value is often considerably larger than the WTP value for the same good or service. This disparity has been widely studied through both theory and experiments (Horowitz & McConnell, 2002 for a nice review). Hicksian welfare theory has attributed the differences found in valuing a good or a service by WTA and WTP to *income effects*. But the implied income effects are implausibly high (Horowitz & McConnell, 2002). Consequently, beyond the standard microeconomic theory, the most studied theories consider *loss aversion*. For instance, the prospect theory (Kahneman & Tversky, 1979; Thaler, 1980; Kahneman, Ritov & Schkade, 1999), based on the notion of reference-dependent preferences, also known as *loss aversion* or *endowment effects*, argues that there is no single value associated with a good and in particular that the prospect of losing a technology individuals use weights more heavily than the prospect of gaining one which they did not try. The explanation of this theory is essentially psychological. Economic theory tries to explain this resistance by information costs, the uncertainty about the value of the good and the impossibility of reversing the process of loss (Zhao & Kling, 2001; Guzman & Kolstad, 2007).

On the whole, economists have empirically investigated the effects on two main categories of factors on the WTA-WTP disparity: i) the CV's study design and elicitation techniques and ii) the nature of the good to be valued. Sayman and Oncüler (2005) present a meta analysis of design factors and show that on top of the payment mechanism described by the prospect theory, the WTA-WTP disparity is lower with iterative bidding than open-ended questions, and in a within-subjects design -i.e. when WTA and WTP values are obtained from the same group of respondents- than in a between-subjects design. About the nature of the good under appraisal, the WTA-WTP disparity depends on the availability of substitutes: since a WTA valuation simulates the need for a good about to be denied, goods with fewer substitutes are more difficult to replace and may require disproportionately more money as compensation. Therefore, the WTA-WTP disparity may be higher when there is no readily available substitute for the good (Hanemann, 1991). The market

availability may also affect the WTA-WTP discrepancy: non-market goods can be characterized by a wider range of consumer valuations, and this ambiguity about the value of the good and the cost of gathering information lead individuals to overstate their WTA and understate their WTP value. The WTA-WTP disparity tends to be much larger for non-market goods (Brown & Gregory, 1999; Kolstad & Guzman, 1999) and in particular for public services. Finally, the WTA-WTP gap may result from emotional and ethical concerns, as well as from social responsibility considerations (Biel, Johansson-Stenman & Nilsson, 2011). Psychologists Peters, Slovic and Gregory (2003) provide evidence that WTA and WTP valuations are constructed by a process guided in part by affect and that emotions and feelings might play so disproportionately with respect to WTA and WTP. Moreover, the WTA-WTP gap may be higher for public goods because of a more ethical dimension since individual choices affect others. For example, Kahneman and Knetsch (1992) suggested that the amount that is reported in survey-based hypothetical WTP studies may not primarily express the respondent's value of goods, but rather the moral satisfaction of behaving in an ethically admirable way, corresponding to the so-called *warm glow hypothesis* (Andreoni, 1990).

The purpose of the present study is to explore the relationship between WTA and WTP in order to improve the knowledge of the perception the cancer patients have of home blood transfusion, with respect to its economic value and the predisposition to the possible substitution of this service (in the hospital day-care unit). Actually, comparing WTP and WTA answers could be informative to identify individuals' behaviors, and particularly to evaluate how differences in emotions and/or moral perceptions could affect the contingent valuation.

Because of the important emotional, moral and ethical aspects we faced, the feasibility of our CV was by no means self-evident. Firstly, it was not guaranteed that the CV approach could be used in a particularly critical clinical situation, i.e. among cancer patients. Indeed, our study population consists in cancer patients who needed blood transfusion, which is often evidence of an advanced

step of disease, and even of a pessimistic prognosis in the short term. Consequently, it was not *a priori* obvious that severely ill patients would be willing not only to participate in the survey, but also to give meaningful responses to WTA and WTP questionnaires because of the emotional and moral dimensions. Besides, to our knowledge, few CV studies have been used for eliciting preferences – use value – among patients with critical clinical prognosis (Iskedjan *et al.*, 2009; Chuck *et al.*, 2008). Secondly, our CV allows an obvious ethical dimension. In France, the costs corresponding to the blood transfusion (at home or in the hospital) are entirely covered by national health insurance. Now health insurance is often considered as vested interests, therefore the hypothetical scenarios of the WTA-WTP questioning process – the potential loss of health care services or possibility to pay to ensure them- could be unreliable and generate protest responses.

More precisely, in this paper, we tried to determine whether the two CV's approaches were feasible in a particularly critical situation from a clinical perception – i.e. among severely ill patients-, and with a strong emotional and ethical dimension, and to understand the process whereby individuals were making their CV decisions in such a context. Our analyses also focused on two main issues: (i) the relationship between stated WTA and WTP values, and (ii) the identification of individual characteristics that account for the disparity between WTA and WTP values.

## **2. Material and methods**

### **2.1 Context**

The present study considers the empirical situation of blood transfusion (BT) for cancer patients. Recourse to BT is frequent when patients have received aggressive treatment, with multiple chemotherapy and radiation courses. Blood transfusions have hitherto usually been administered in



the hospital. However, with an ever-increasing demand for acute hospital services, alternative methods of delivering this health care need envisaging.

For most patients, BT can be delivered at home or in the hospital day-care unit with identical effectiveness and safety, and therefore identical health outcomes (Idri *et al.*, 1996; Madgwick & Yardumian, 1999). But, non-health benefits such as process utility may play a major role in the choice of care. The location of transfusion may be viewed differently from one patient to another. Home blood transfusions may be psychologically beneficial, in that they keep the patient in familiar surroundings and avoid the complication of transportation. Particularly among older and more severely ill patients, transportation difficulties or waiting time at the medical facility may require additional effort, while remaining at home may decrease the patient's tiredness and thus be considerably more comfortable (Devin & Agnew, 2008). Nevertheless, transfusions at home are potentially stressful and anxiety-producing situations: it may increase the feeling of insecurity because of isolation and increased distance to emergency care (Benson, 2006; Benson *et al.*, 1998).

## **2.2 Survey design**

Our CV survey was realized at the Comprehensive Cancer Centre of the Rhone-Alps Region in Lyon (France). In addition to BT delivered in the hospital day-care unit, some patients also received BT at home in collaboration with the national blood service (EFS: Etablissement Français du Sang) within a regional cancer network stationed on the hospital. This prospective, non-randomised study was conducted during a 12-month period in 2003-2004. All cancer patients needing a BT and who were more than 18 years of age were asked to participate. After obtaining informed consent, and less than 48 hours after BT administration, face-to-face interviews were conducted by a trained interviewer on the basis of a detailed guide. Although costly, this type of interview was chosen for minimizing hypothetical biases and improving the quality and responses rate (Mitchell & Carson,

1999; NOAA, 1993; Smith *et al.*, 1999).

Patients were first asked whether they had already undergone, either BT in the hospital or at home, including the current procedure when it was administered at home, and whether they had already received home care other than BT. All patients were then given a detailed presentation of the BT management, either at home or at the hospital, and were told that effectiveness and safety were identical in both cases.

### **2.3 WTP/WTA questioning process**

All patients were given a general presentation of the CV method. We carefully explained the benefits using this method in order to provide policy-makers with valuable information about patients' preferences. It was indeed feared that this approach might be poorly accepted by French patients, particularly when seriously ill, who are strongly attached to their national health insurance system.

Then they were asked to imagine two hypothetical scenarios where they would need another BT and where the only freely available BT management would be hospital BT. The first one evaluated WTP for home BT by asking patients how much they would be willing to pay for this service rather than the free alternative and, immediately after that, what level of compensation they would be willing to accept for renouncing it. More precisely, patients were asked to imagine that the government decided to reduce the number of BT outside the hospital. Their WTP value would be the maximum amount of money they were willing to contribute to still be transfused at home rather than at the hospital which is fully covered by Health Insurance. Their WTA value would correspond to the minimum compensation they would accept for undergoing hospital BT rather than home BT.

Considering the payment vehicle, we chose out-of-pocket expenditure, which is recommended when respondents are personally involved (Smith, 2003; Mitchell & Carson, 1989; O'Brien &

Gafni, 1996). A bidding process was chosen rather than closed-ended questions because of our small sample size (Donaldson *et al.*, 1998) and the lower expected WTA-WTP disparity (Sayman & Oncüler, 2005). The process involved three steps. First, an initial bid was proposed to the patients. In the case of WTP (WTA), if they agreed to pay (refused to accept compensation), we proposed a higher bid. Conversely, if they refused to pay (agreed to receive compensation), we proposed a lower one. This step was repeated twice. In the WTP case, if the patients refused to answer (a zero WTP value was attributed to this non-response) or when the bidding process yielded a zero value, the interviewers were instructed to ask follow-up questions to identify the reasons for this choice. In the WTA case, follow-up questions were introduced again if the bidding process yielded a zero value or if patients reported that no amount was deemed sufficient to compensate for the renunciation of the home management (we referred these responses as “infinite WTA values”). Patients were randomly assigned to two initial bids (40€ and 80€) to test for a possible anchoring bias (Herriges & Shorgen, 1996; Flachaire & Hollard, 2007). The range from 40€ to 80€ was chosen because it was close to the range of fees normally covered by social insurance in France for a home visit by a specialist (including call-out charges). Respondents rated their certainty about their WTP and WTA on a 10 cm Visual Analogue Scale (VAS) (from 0=’not at all certain’ to 10=’absolutely certain’)<sup>1</sup>.

Socioeconomic characteristics (age, employment, monthly family income before tax, marital status, children, distance from hospital, etc.) were documented by the patients themselves. Information on stage of disease (curative, palliative or terminal) was reported by the oncologist in charge of the Home Care Unit at the Cancer Centre. We also constructed a health-related quality of life index including tiredness as measured by the Functional Assessment of Cancer Treatment General scale (FACT-G) (Cella, 1993), which varied from 0 (worst possible situation) to 108 (best possible estimation).

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1 The WTP/WTA questionnaire is available from the authors upon request.

## 2.4 Statistical analysis and econometric specifications

Summary statistics for patients' characteristics and WTP and WTA amounts, including mean and standard errors, were calculated. Using nonparametric statistics, as appropriate, we first examined differences between stated WTP and WTA values, and their respective level of certainty. Subsequently, multivariate analyses were carried out in order to identify and compare the determinants of WTP and WTA. The choice of appropriate WTP and WTA modeling was also driven by the obtained distribution.

Zero values should receive particular attention in the econometric analysis of WTP determinants, as is usually the case in the CV literature. Not only the patients going zero responses represented an important proportion of the whole sample, but also there was a range of possible explanations for zero values, from true zero responses consistent with economic and rational decisions (i.e. nil or very small preference, inability to pay) to protest responses with no economic significance, which indicate respondents' disapproval (Strazzera *et al.*, 2003). Indeed, protest responses can result from informational constraints, social responsibility considerations, objections to the support payment and/or emotional concerns. For example, they could reflect an ideological position against health care valuing. According to the empirical literature, the double-hurdle is the most appropriate econometric approach for zero and protest responses (Dalmau-Matarrodona, 2001). Nevertheless, it cannot be used when the number of protest responses is too small like in our study (see section 3). In Havet *et al.* (2011), a first study of our WTP values, it was showed that the truncated regression model could be an appropriate econometric methodology for modeling them<sup>2</sup>: the estimation was based on strict positive WTP only and took into account the elimination of all zero values to obtain valid results for all patients. More precisely, this model specified the probability to observe the

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<sup>2</sup> Havet *et al.* (2011) showed that similar results were found with a type II Tobit. However, the truncated regression model was preferred here for an easier comparison with the WTA modelling.

amount of WTP, conditional on the expression of positive willingness-to-pay:

$$y_i^p = y_i^{p*} \dots \text{if} \dots y_i^p > 0 \quad (1)$$

where  $y_i^p$  is the value of the  $i^{\text{th}}$  observation on the dependent variable WTP and  $y_i^{p*}$  its corresponding latent value, described by the relation  $y_i^{p*} = X_i\beta + u_i$  with  $X_i$  the independent variables that influence the WTP amount,  $\beta$  the unknown parameters and  $u_i$  the error term such as  $u_i \sim N(0, \sigma_u^2)$ .

As regard the distribution of the WTA values (left-censoring at zero with protest responses and a significant part of « infinite » values, which constituted a right censoring, see section 3), we estimated a Tobit model on truncated sample. Indeed, for the same reasons as the WTP analysis, our WTA estimation was based on strict positive WTA values only and so on a truncated sample. In order to allow « infinite » responses in the regression, we replaced these missing values by an arbitrary threshold, noted  $c$  (representing a very high WTA value). The Tobit model was also the most appropriate to the treatment of the right censoring at the  $c$  value. Therefore, the standard Tobit was modified to obtain valid results for all patients despite the elimination of all zero values<sup>3</sup>:

$$y_i^a = \begin{cases} y_i^{a*} \dots \text{with } y_i^{a*} = Z_i\alpha + v_i \text{ if } y_i^{a*} > 0 \text{ and } y_i^{a*} < c \\ c \text{ if } y_i^{a*} \geq c \end{cases} \quad (2)$$

where  $y_i^a$  is the value of the  $i^{\text{th}}$  observation on the dependent variable WTA and  $y_i^{a*}$  its corresponding latent value,  $Z_i$  the independent variables that influence the WTA amount,  $\alpha$  the unknown parameters and  $v_i$  the error term such as  $v_i \sim N(0, \sigma_v^2)$ . We reported the results of the WTA model obtained with  $c$  equal to 1500 euros. We also tried other  $c$  values for robustness purposes: they confirm the independence of our results to the chosen threshold. In our estimations, the dependent variables  $y_i^p$  and  $y_i^a$  were expressed in logarithm.

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<sup>3</sup> The estimation procedure for the Tobit on truncated sample was programmed using the software Stata 10.1.

### **3. Results**

#### **3.1 Sample Characteristics**

Over the study period, all 153 solicited patients consented to participate. However, 14 people could not be interviewed within the 48 hours following their BT either because of lack of availability or because they felt too tired. As a result, 139 patients (90.9%) were enrolled.

The mean age of the patients (69 males and 70 females) was 57.5 years ( $\pm 12.8$ ). Most lived in a marital relationship (73%) and had no children at home (71.2%). Less than half (43.2%) had a professional occupation. Pre-tax net monthly household income distribution was as follows: less than 800€ -12.2%, between 800 € and 1 499 € - 28.2%, between 1 500 and 2 299 € -25.9%, between 2 300 and 2 999 € - 16.8%, 3 000 € or more -16.8%. The average distance from home to hospital was large (nearly 40 km) because of the over-representation of rare tumors. Almost one in two respondents had previous experiences of home BT on the one hand and of home care (except home BT) on the other (43.2% and 45.3% respectively). Regarding stage of disease, patients were almost equally distributed between curative (50.4%) and palliative or terminal stages (49.6%). Quality of life scores, assessed according to the FACT-G scale ranging from 0 to 108 (worst to best quality of life), were rather poor, with an average index of 61.7.

#### **3.2 Descriptive analysis of WTP and WTA responses**

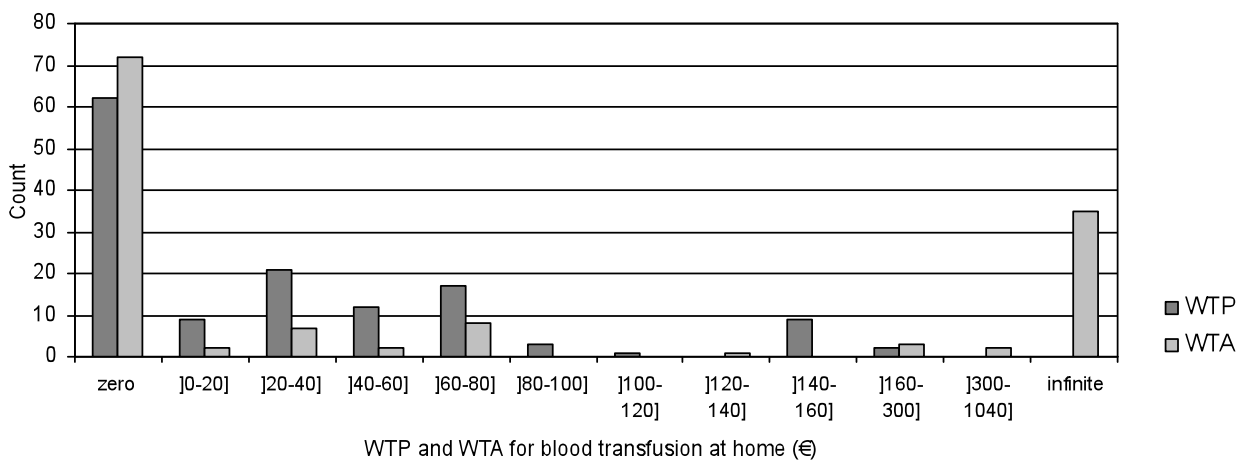
Table 1 exhibits a cross-tabulation of WTP and WTA values. Three patients (2.2%) expressed comprehension problems with the two CV tasks and offered so neither WTA nor WTP values for home BT. Three others did not understand the WTA method and one patient refused to answer WTA questions.

**Table 1. Cross-tabulation of WTA and WTP values for home blood transfusion**

WTP	Comprehension Problem	Zero value	Positive value	Total
Comprehension problem	3	0	3	6
Non-response	0	0	1	1
Zero value	0	54 <sup>(a)</sup>	18	72
Positive value	0	4	21	25
Infinite value	0	4	31	35
Total	3	62	74	139

(a) Of whom 42 patients preferred hospital BT.

For the 132 patients without comprehension problems and non-responses, WTP and WTA values are displayed in Figure 1.



**Fig. 1. Survey distribution of WTP and WTA for home blood transfusion**

The WTP distribution contains a high proportion of zeros (47.0%) and otherwise is positively skewed. The highest WTP value is 300€ for home BT. The graph presents typical pattern of WTP studies from open-ended questions or a bidding process (Jorgensen *et al.*, 1999; Lindsey, 1994;

Donaldson *et al.*, 1998). Follow-up questions allowed to distinguish between “genuine” zero values and “protest” responses and therefore to better understand the individual preferences and to assess the ability to implement cost-benefit analysis. We were able to determine that 8 (12.9%) of the 62 zero WTP values were “protest” zeros, on the basis of statements such as “I have paid health insurance premiums all my life and I should not have to pay anything more”, “the goal of this kind of study is that we pay more and more for care” or “I do not want to pay for blood when the donors are unpaid volunteers”. Clearly, these 8 patients reacted negatively to the payment vehicle. The remaining 54 zero WTP values were considered as “real” zeros, as opposed to the protest responses: among them, 12 patients participated in the bidding process which resulted in zero values, either because of low income or without any justification, and the other 42 patients clearly expressed that they would prefer to receive BT in the hospital rather than at home and also were not willing to pay for home BT.

The WTA distribution shows a U-shaped pattern: in addition to the large number of zero responses (54.5%), 35 patients (26.5%) reported that no amount was deemed sufficient to compensate for the renunciation of their home BT management and were also classified as “infinite WTA values”. In the follow-up questions, most of these 35 patients justified their WTA answers by either utilitarian argument such as “maintaining the quality of life is priceless” or by ethical consideration of the kind: “it is out of question to renounce health rights”. In the particular context of our study, the expression of an infinite WTA could correspond to a rational choice: patients were seriously ill, and even likely to receive palliative care in the short or long term. It is reasonable to expect that any deterioration in quality of life would have a significant impact on these patients and that they found it impossible to consider a substitute for their preferred BT management. These patients’ responses correspond to an extreme preference, which is not quantifiable.

Among the 72 WTA zero values, 24 (33.3%) could be considered as protest responses and 48



(66.7%) as genuine zero. Indeed, in the follow-up questions, 11 patients clearly stated a moral position or expressed a refusal on principle to accept monetary compensation for failure to obtain their home BT. It also seemed especially immoral for patients to be paid for receiving blood when donors are volunteers, even if the payment covered the administration of blood and not the blood itself; there would be a transfer of moral taboos associated with the merchandising of blood. These 11 responses did not seem to reflect the actual preferences of the patients. The remaining 13 protest bidders indicated a zero WTA without giving any reason while they indicated a WTP greater than 0. It was also legitimate to assume that these 13 WTA values did not correspond to actual preferences: by expressing a non-zero WTP, they showed that they were not indifferent between hospital and home BT. Among the 48 “genuine” zero values, there were again the 42 patients preferring hospital BT and 6 patients who expressed both zero WTA and WTP values with no justification. We considered these latter responses as true zero preferences for lack of additional information.

### **3.3 Quantitative analysis of WTP- WTA discrepancy**

Data from the patients who had problems understanding WTP and/or WTA questioning were eliminated from empirical analyses.

#### *3.3.1 Univariate analyses*

Since “infinite WTA” responses represent a very high but unquantifiable preference, the WTA-WTP gap is incalculable. That is why we examined the difference related WTP and WTA values using the Sign test, which compares the number of positive or negative differences between the two measures but ignores the size of these differences. We obtained that WTA was significantly greater than WTP, whether excluding protest zeros ( $p < 0.0001$ ) or including protest responses as zero WTP (or WTA) ( $p = 0.0028$ ).

However, the WTA approach generated more protest responses than the WTP approach (18.2% of

the complete responses versus 6.1%). Consequently, we wanted to know how patients felt about the two CV methods and particularly if they had a preference for one approach. To do this, we used the responses obtained about the WTA and WTP certainty by the Visual Analogue Scale. The Wilcoxon signed-rank test allowed to identify possible differences in the degrees of certainty between WTP (mean: 8.0; SD: 2.6) and WTA (mean: 8.5; SD: 2.3) for patients choosing home BT. Results indicated no significant differences between the two scales ( $p=0.1540$ ).

### *3.3.2 Regression models on WTP and WTA data*

We tried to identify the individual characteristics that could account for the observed difference between WTA and WTP values with regression models. Since the WTA-WTP gap was incalculable because of the “infinite WTA” values, our strategy was to find the determinants of the WTA and WTP values separately and to compare them. Table 2 reports the results of the WTP truncated regression and the WTA Tobit model on truncated sample.

**Table 2. Results of the truncated regression model of WTP (log) and WTA (log) values**

Explanatory variables	WTP (log)		WTA (log)	
	Truncated regression		Tobit model on truncated sample	
	Coeff.	t-ratio	Coeff.	t-ratio
Intercept	3.15***	5.92	5.69***	2.66
Income (1= 2 300 € or more)	1.03***	6.93	0.74	1.35
Experience of home BT (1=yes)	0.19	1.13	0.42	1.17
Experience of home care, except BT (1=yes)	0.41***	3.17	-0.91**	-2.07
Distance to hospital (continuous scale)	4.00 E-3**	2.02	-0.01**	-2.56
FACT-G (continuous scale)	- 0.01*	-1.86	4.98 E-3	0.41
Stage of disease (1=curative; 0=palliative or terminal)	0.31**	2.28	0.15	0.28
Living with a partner (1=yes)	- 0.46***	-2.79	-0.63*	-1.66
Children at home (1=yes)	0.24	1.70	-0.43	-1.09
Gender (1=male)	0.18	1.38	0.58	1.45
Age (continuous scale)	0.01*	1.91	-0.02	-0.70
Professional occupation (1=yes)	- 0.51***	-3.36	-0.61	-1.09
Initial bid	0.37***	2.79	0.61	1.19
$\Sigma$	0.475***	11.66	0.454***	7.63
Log likelihood	-43.81		-29.91	
Number of observations	65		56	

\*p<0.1 ; \*\*p<0.05 ; \*\*\*p<0.01

First, considering the truncated regression results, the sign and significance of several covariates behaved as expected. The health economics literature suggests that income positively influences WTP values (Donaldson, 1999; Smith *et al.*, 1999; Drummond *et al.*, 2005) and that choosing a higher initial bid value could increase WTP responses, but would in no way decrease them (Smith

*et al.*, 1999; Herriges & Shorgen 1994; Flachaire & Hollard 2007). This income effect and the anchoring bias hypothesis, often considered as a guarantee of the construct and content validity of a survey, were confirmed in our study: all other things being equal, the WTP value for home BT increased with higher income and with higher initial bid. Several patient characteristics were also significantly associated with WTP for home BT: experience of home care, distance from home to hospital, stage of disease, professional and familial statuses and age, as well as health-related quality of life. However, neither previous experience of home BT nor gender and the presence of children seemed to influence WTP values. More precisely, elderly patients or patients living far from the hospital stated a higher WTP for home BT than other patients. Those with a higher health-related quality of life stated a lower WTP for home BT, which means that home BT was all the more appreciated as patient quality of life (including tiredness) was low. This is in agreement with the medical literature (Devlin & Agnew, 2008; Ademokun *et al.*, 2005; Benson, 2006) which suggests that sparing painful transportation and waiting time are strong reasons for preferring home BT. Conversely, the WTP for home BT was lower by 40% for advanced-stage (palliative or terminal) than early-stage (curative) patients. We could assume that patients would be all the more sensitive to safety concerns that their lives would be threatened, and that hospital could be generally considered as safer by patients. Previous experience of home care proportionally increased the WTP for home BT. Lower WTP values for home BT were obtained for patients living with a partner. All other things being equal, WTP for home BT was lower for patients with a professional occupation.

By contrast to the WTP equation, few explanatory variables emerged as a significant influence on WTA. Only three patients characteristics were significantly associated with WTA for home BT: experience of home care, distance from home to hospital and to a lesser extent familial status. The WTA analysis confirmed that patients living far from the hospital and patients with a previous experience of home care would have higher preferences for home BT. However, the statistical

insignificance of the income and initial bid variables could raise doubt about the construct and content validity of the WTA survey. Therefore, the WTP-WTA gap should not be a surprise since the responses to both CV methods do not seem to share the same determinants.

#### **4. Discussion**

Although the WTA-WTP disparity has been commented on at considerable length in behavioral economics, only a small number of studies have conducted WTA analysis in health care context (O'Brien *et al.*, 1998; Borisova & Goodman, 2003; van den Berg *et al.*, 2005; Whynes & Sach, 2007; Martin-Fernandez *et al.*, 2010). And yet, the differences between WTA and WTP can help to understand not only the value attributed to a health service but also the capacity to substitute it or the resistance of its loss. For example, a positive WTA-WTP discrepancy would mean that patients require a larger compensation for the withdrawal of an existing service than they would have been willing to pay for its introduction, which has an important implications for economic evaluation of health technology assessment and care organization. Here, it seems to us that the comparison of the WTP and WTA to our very particular situation – blood transfusion setting in advanced stage cancer patients - would provide some additional understanding of the behavior of respondents. More precisely, our analyses focused whether cancers patients would accept the two elicitation formats, and if yes, they would behave differently with the two approaches proposed,

While administration of a CV survey to patients receiving intensive chemotherapy or near the end of life may appear somewhat incongruous, we found that patients have massively responded. More than 90% of the solicited patients consented to participate. For instance, in their literature review about WTP in health and health care, Smith *et al.* (1999) found a mean participation rate of 74% among the studies. Moreover, very few participants had comprehension problems of the CV method: approximately 2% and 5% for the WTP and WTA approaches respectively.

These results are particularly interesting because they show that the criticality of a health situation is not an *a priori* obstacle to the achievement of such a study. The ability of respondents to accept a CV questioning in a context of high health benefits had already been partially investigated in the literature. A dozen studies had conducted WTP questioning on health programs with major consequences either on psychical or physical well-being of respondents' quality of life or on their life expectancy (e.g., recently Geelhoed *et al.*, 2009; Radtke *et al.*, 2009; Iskedjian *et al.*, 2009; Saulo *et al.*, 2008; Chuck *et al.*, 2008; Lacour *et al.*, 2008; Khanna *et al.*, 2008; Bishai *et al.*, 2008). Nevertheless, none of these studies have dealt with so severely ill patients, with so limited life expectancy and only two of them had simultaneously conducted a WTA analysis (Whynes & Sach, 2007 ; Borisova & Goodman, 2003).

Several reasons can explain why so many patients have accepted to answer the valuation questions. First we put a great emphasis on the information we gave them through face-to-face interviews and we introduced ourselves as independent researchers with no ties to hospitals and welfare-financing agencies in order to avoid any suspicion of instrumentation results. Second, we did explain to transfused patients that contingent valuation aimed at gathering their preferences, which could be used to define health policy. These patients appeared to be concerned about their preferences being taken into account as users and contributors to the health-insurance system. Third, we wanted to elicit preferences for a health program with which patients were familiar enough to easily picture its outcomes. Using respondents with a relatively realistic contingent market, all patients would have experienced blood transfusions at the hospital, and all would have information on close substitutes. This might reduce the risk of hypothetical biases associated with hypothetical questions and would produce a more realistic valuation.

This intimate knowledge of the good under appraisal probably helped patients to internalize its

costs and benefits and to give meaningful responses, at least for the WTP approach. Any far-fetched or exaggeratedly high WTP value had been expressed and only 5.8% of participants gave protest responses. Moreover, the econometric results on the WTP determinants were consistent with what was expected. For instance, the classical anchoring effect was confirmed. We also obtained, all other things being equal, a significant and positive relationship between income and WTP. This positive income elasticity is one criterion generally required for the construct WTP validity (Donaldson, 1999; Smith *et al.*, 1999; Drummond *et al.*, 2005): it is the evidence that patients do internalize their budget constraint when revealing their preferences and that our WTP results are in accordance with theoretical explanations.

Our results with the WTA approach are a bit less convincing. First, the proportion of protest responses for home BT was higher (18%). Even if patients can justify their protest responses, the criterion validity of CV will suffer from too high a number of them and cost-benefit analysis will be hard to implement. Second, 26% of the patients reported that no amount was deemed sufficient to compensate for the renunciation of their home BT management and were considered to have “infinite” WTA values. In our particular critical situation, such arguments for infinite WTAs are understandable: patients at the end of life may refuse to renounce their quality of life whatever the amount of financial compensation. However, even if these patients answer in accordance with their preferences, they provide no usable values in a cost-benefit analysis by decision-makers. Third, any socioeconomic variable significantly influence the patients' WTA values. In theory, we expected that the same explanatory variables play on WTA and WTP values. For example, we could expect a positive impact of income on WTA since the marginal utility of a given amount is larger for the poorest. It is also obvious from our econometric results that individuals' strategies towards constructing their WTP and WTA values differ in terms of determinants, reasoning, use of information and economic rationality.

The direct consequence is the significant WTA-WTP disparity. Yet, we had purposely chosen an iterative bidding process and a within-subjects design, in order to limit the gap between the two CV approaches. Similarly, we have evaluated the patients' preferences for home BT, which has a very close substitute *a priori* since home BT and hospital BT do not differ in safety and health outcomes. Unfortunately, we can not exactly measure the WTA-WTP gap because of infinite WTA values. As an approximation, we have computed the ratio of mean WTA to mean WTP but ruled out the patients with protest responses to at least one of the two CV tasks and those who did not give a precise value for their WTA. For this sub-sample of 71 patients, the WTA/WTP ratio was 2.3 (20.57 euros/47.58 euros). However, since it overlooks patients with infinite WTA, it widely underestimates the difference for all patients. Therefore, we can conjecture that the true WTA-WTP divergence in our case is very much higher than values found in other studies when referring to goods or services in the field of health (O'Brien *et al.*, 1998; Borisova & Goodman, 2003; van den Berg *et al.*, 2005; Whynes & Sach, 2007; Martin-Fernandez *et al.*, 2010). In a classic evaluation, O'Brien *et al.* (1998) obtained a WTA/WTP relationship of approximately 2 for a new drug to treat cancer. In another paper on the treatment of drug-dependent persons, the WTA/WTP ratio was situated at about 1.3 (Borisova & Goodman, 2003). Martin-Fernandez *et al.* (2010) reported a WTA/WTP ratio of about 3.3 when valuing the visit to family physician. The valuation of surgical techniques, a cochlear implant, in a population of children, produces values for this ratio approaching 4 (Whynes et Sach, 2007). When valuing providing care to the chronically ill the relationship between WTA and WTP closely approaches the unit (van den Berg *et al.*, 2005).

Higher rate of protest responses, important proportion of unquantifiable values and the non-significance of the major socioeconomic determinants suggest the existence of strong ethical and moral considerations in the individual WTA decisions. They show that the patients' preferences can only be imperfectly elicited by a monetary equivalent and then show the limits of CV methods. Others have suggested that the influence of a moral perspective may be particularly strong under



WTA and may also explain a large part of the WTA-WTP divergence (Boyce *et al.*, 1992; Irwin, 1994; Nyborg, 2000; Peters, Slovic & Gregory, 2003; Sayman & Öncüler 2005). The ethical and emotional dimensions are very likely to have the dominant effect in our empirical situation. Indeed, our contingent valuation focused on a public good which was far from an « ordinary private good available in the market » (Kolstad & Guzman, 1999; Brown & Gregory, 1999; Horowitz & McConnel, 2002) and was health related (Chapman & Johnson, 1995; Brown & Gregory, 1999). In the WTA approach, people were asked to imagine a situation where, for a hypothetical reason (government decision to promote hospital, organizational difficulties, saturation of healthcares), a compensation would be granted to renounce blood transfusion at home. People might have considered that, if home health care was socially difficult to be maintained, it would not be very ethic to ask for a compensation of their loss of life quality. Thus, a zero WTA would not mean only a refusal of this questioning mode; it would also illustrate that the patients' utility to behave as citizens and to take part to the preservation of the health care system is greater than the disutility to not benefit from their favorite BT management. Many patients also gave an infinite WTA on the basis of moral principles. They indicated in their free comments that they refused to renounce an universal right of care access, considered as an endowment. Indeed, the French health care system relies on universal access and on the solidarity between all members through their contributions. For long-lasting diseases such as cancer, it guarantees a full coverage of costs. In the context of a growing private sector, some patients expressed their will to preserve this system based on the participation of all. Therefore, with a zero or infinite WTA, individuals might have maximized their moral satisfaction instead of their purely economic utility. Our results seem consistent with the “warm-glow” hypothesis, shown for other public goods (Kahneman & Knetsch 1992). They could also be interpreted at the light of Mc Graw & Tetlock (2005)'s arguments who defined the «taboo-trade-off» notion. The WTP approach is based on scenario where patients hypothetically buy a good or a service but the WTA approach (in our paper but also in other health-related cases) offers patients the possibility to trade for money some potentially sacred aspects such as life quality or

maintaining a relationship with relatives, which is a transgression of the forbidden. Given the emotional impact on patients of the deterioration of their well-being, a trade-off in this direction becomes abhorrent and taboo (Whynes & Sach, 2007).

## **5. Conclusion**

As Whynes and Sach (2007), we found that the evaluation of public health services made from the perspective of gain or loss is different, and this should be taken into account if patient preferences are to be incorporated to health planning. Our results indicate that we should have higher confidence with WTP than WTA to build a cost-benefit analysis. In the health care context, the numerical style of WTP elicitation can be difficult to transpose for WTA. The WTP scenario refers to a structure market revealing preferences while the WTA one appears to be a measure on emotions and the respect of social norms. In all cases, ethical and moral concerns must be taken into account for the health policy definitions and health care strategies. Since the patients' preferences seem to be only imperfectly elicited by a monetary equivalent, a qualitative analysis of the responses is necessary. If warm glow and taboo trade-off effects are substantial and underline the limits of CV methods, an alternative method could consist in resorting to experimental economics to reveal preferences as suggested by Robin, Rozann and Ruffieux (2008).

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