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# Order Bias in Estimates of Willingness To Pay for Drugs to Treat Attention-Deficit/Hyperactivity Disorder. A Contingent Valuation Study among Students.

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## **ABSTRACT**

**OBJECTIVES:** New drugs with extended release formulations are being developed to treat patients with ADHD. While currently available drugs need to be administered two or three times daily, the new medication offers the prospect of a once-daily administration with a more consistent working profile throughout the day. The purpose of the present study is twofold: 1) to establish WTP for this improved formulation as compared to WTP for the standard drug, and 2) to ascertain whether the order in which the drugs are presented to respondents influences the results obtained.

**METHODS:** A pre-tested questionnaire was administered to 114 final-year economics students from the University of Antwerp. In order to simulate a binding income constraint, the students were told to consider themselves as the head of a household with a specified disposable income. The level of the income that was imposed varied. After receiving information about ADHD and about the available treatments, respondents' WTP was elicited using the payment card method. Respondents could answer 'yes' or 'no' with varying degrees of certainty. A split sample was used to test the hypothesis that the order in which the drugs are presented in the survey is significant.

**RESULTS:** The average willingness to pay per month amounts to €57.34 "definitely" and €74.29 "probably" for the standard drug and to €81.95 "definitely" and €95.12 "probably" for the new drug. The difference between the respective WTP for the drugs is statistically significant (Wilcoxon Signed Rank Test). Students state a higher WTP for the new drug if the standard therapy is presented first (Mann-Whitney U Test).

**CONCLUSIONS:** The present study provides further evidence of the validity of the Contingent Valuation Method (CVM) for establishing WTP. It shows that WTP for drugs can be elicited from a student population with an imposed income. The study also shows that WTP for a new drug varies according to the order in which the respective drugs are presented. This may be due to order bias, evidence of which has also been found in other studies and which is considered to be a limitation of the method.

## **Introduction**

### ***Attention-Deficit Hyperactivity Disorder and its treatment***

Attention-Deficit/Hyperactivity Disorder (ADHD) is a mental health problem that is particularly prevalent in schoolchildren. It is estimated to occur in 1 to 5 percent of the school-aged population (Klassen et al., 1999; Zametkin, A., Ernst, M., 1999). The disorder has three cardinal features: difficulty in concentrating on activities for long periods of time (inattention), excessive movement (hyperactivity) and acting without thinking (impulsiveness). To be considered maladaptive and inconsistent with the child's developmental level, these symptoms should be persistent and sufficiently severe. The disorder affects children's school results and social behaviour. Most children continue to show symptoms into adolescence and as adults, though they usually become less severe (Zametkin, A.J., Ernst, M., 1999).

Methylphenidate hydrochloride, a central nervous system stimulant, is the most commonly used medication for ADHD. Methylphenidate hydrochloride is a prescription drug that is not reimbursed under the Belgian healthcare system. Meta-analysis of trials comparing treatment with methylphenidate versus placebo show that the drug is efficacious and improves core ADHD behaviours. Its side effects, the most common of which (>10%) are nervousness and sleeplessness, are generally mild. The drug works for between 4 and 8 hours, so children are required to take it twice to three times daily. This is a drawback, mainly because in-school dosing can lead to teasing and bullying. Another negative aspect of the standard drug treatment is that symptoms tend to get worse approximately 8 hours after administration, so that the child exhibits 'peaks and troughs' in plasma levels during the day. A third inconvenience of twice- or thrice-daily intake is that it creates uncertainty about treatment compliance: one can never be sure whether the child has taken its medication or not (Swanson, J.M. et al., 2000a). A new drug with extended release formulation is being developed that combines a rapid onset of action with reliable and continuous osmotic release of methylphenidate, thus providing a full 12-hours of symptom control. In other words, the new drug offers the advantage of a once-daily intake with a more consistent working profile throughout the day. This means that the child can function more effectively than with the standard drug treatment. A controlled trial (3 times standard drug versus new release + 2 times placebo versus 3 times placebo) has shown that parents prefer the new release significantly to the standard drug and the standard drug significantly to placebo (Swanson, J.M. et al., 2000b; Pelham, W.E. et al., 2001). Production of the extended-release drug is, however, more expensive, so that it will be marketed at a higher price than

Methylphenidate. In this context, it is worth establishing whether respondents are willing to pay more for the new medication.

### ***Willingness to pay (WTP) for ADHD treatment***

New drugs or other medical treatments have the potential to improve patients' health. Often, such new treatments are more expensive than existing ones. Given that healthcare budgets are limited, it is not self-evident that every new medical procedure is introduced on the market, let alone reimbursed. Additional costs should be weighed against additional benefits. Only efficient interventions should be adopted<sup>1</sup> for which the beneficiaries are prepared to bear the entire cost. This implies that one needs to establish the monetary value of a treatment, or of the health improvement that it represents, and compare this value with the cost involved.

In the recent literature on the economic evaluation of healthcare, there has been much interest in the use of the Contingent Valuation Method (CVM) for measuring willingness to pay (WTP) for health benefits. CVM tries to reveal WTP in hypothetical surveys. While the method was developed primarily for assessing environmental benefits, the number of CV studies in the healthcare field is now rapidly increasing.

However, some important methodological questions remain unanswered. In fact, Johannesson (1996) asserts that, in spite of the large number of CV studies conducted, the validity of the method is still in doubt. He therefore calls for feasibility studies, particularly with regard to CV of healthcare goods, as the validity of the method may vary for different types of commodities. The present study hopes to contribute in this respect. Indeed, its objective is twofold. First, it intends to measure and compare WTP for the standard ADHD drug with WTP for a new, improved medicine. Second, it aspires to contribute to research into some methodological aspects of CVM. More in particular, it sets out to establish whether it is feasible to apply the method to a survey population of students. A further methodological concern of the study is whether the order in which the drugs are presented to respondents has an influence on the WTP values obtained.

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<sup>1</sup> In addition to efficiency, also equity considerations have to be taken into account, but these are disregarded in this study.

## **Methods**

### ***Sample***

For practical reasons, our survey was based on a sample of 114 final-year economics students at the University of Antwerp, 110 of whom completed the questionnaire.

As drugs to treat ADHD are not reimbursed under the Belgian healthcare system, it could be argued that the most appropriate target group to establish private WTP for such drugs would consist of patients or their parents. However, this is not an easy group to identify. Moreover, sending out a questionnaire to all these individuals would be rather costly, while the response rate might be relatively low. The present study was conducted within the scope of a final-year thesis, which meant that both time and money were limited. Preference was therefore given to eliciting WTP from a sample population of students. This not only guaranteed a high response rate, but it also provided an opportunity to investigate an important methodological issue, namely the feasibility of applying CVM to student populations. One of the objectives was to compare our own results with those obtained in previous studies (Krabbe, P.F.M. et al., 1997, p. 1641-1652; Pennie R.A. et al., 1991, p. 12-15).

### ***Contingent Valuation Method***

A three-part survey was used to elicit WTP from the students. Part I of the survey was informative: it explained about ADHD, the symptoms of the disorder, its consequences for patients, and the available treatments.

Part II consisted of a questionnaire that was, in part, designed to elicit socio-economic characteristics of respondents, including age, sex and branch of studies. Subsequently, the respondents were asked whether they had heard of ADHD. They were also asked whether they themselves had the disorder and, if they did, whether they were on medication to treat it. Finally, they were asked whether they knew any children with ADHD and, if they did, whether these children were on medication.

In part III of the survey, respondents were introduced to the first treatment drug. Information was provided about the frequency and time of administration, as well as about possible side effects and the efficacy of the drug. This was followed by WTP-questions. Subsequently, the second medicine was introduced in a similar fashion, again followed by questions regarding WTP.

The students were asked to think of themselves as the head of a household with two children, and to state their WTP for the drug treatments assuming that one of these children had been diagnosed with ADHD.

The WTP of the students was established using the *payment card method*, which tries to elicit respondents' maximum WTP. Previous experience has shown that it can be hard to get respondents to state their maximum WTP. The payment card method overcomes this problem by proposing a range of values from which respondents can make a choice. In this particular study, the values ranged from € 2.5 to € 75, with fixed intervals of € 2.5. Respondents could also choose to indicate a higher WTP. In the latter case, they were required to fill in an exact monetary amount.

According to the literature on CV, the payment card method leads to problems of starting-point and end-point bias. The method was nevertheless retained because it yields more information than a binary choice question.

The survey was designed in such a way that respondents could accept or reject the proposed values with varying degrees of certainty: they were presented with a choice between 'definitely not', 'probably not', 'yes, probably' and 'yes, definitely'. Some authors would argue that only values accepted with 'yes, definitely' correctly represent respondents' WTP (Johannesson, M., Johansson, P.O., 1993, p. 100-103). Other authors would also take into consideration values accepted with 'yes, probably' when estimating WTP. The latter approach has been labelled the 'standard' interpretation by some authors (Eckerlund et al, 1995; Kartman et al, 1996). Others, however, have shown it to lead to inflated estimations (Blumenschein et al., 1998, p. 172-174). The present study considers both interpretations.

The questionnaire was pre-tested on a group of fourteen students. Their comments were taken into account and the questionnaire was modified slightly. One of the remarks was that it is difficult for students to assess how much of their hypothetical income they can spend on medicine, because they have no clear idea of the cost of living. Therefore, expenditure data were retrieved from a household budget survey and included in the questionnaire (e.g. respondents were told that a family with a net monthly income of €2000 spends an average €330 on food, €118 on clothes, €190 on transport, etc).

As most students have no real income, while income is crucially important in any CV study, the survey uses "imposed" incomes, a technique that has been applied before in a CV study involving students (Krabbe, P.F., 1997, p. 1641-1652). However, in the latter case, all respondents were assumed to have the same disposable income, i.e. a standard study grant after

subtraction of the price of accommodation and fixed costs for food, heating, clothing, etc. In our sample, imposed income varied: one-third of respondents had a monthly income of €2000, one-third had €2500 at their disposal, and the rest had an income of €4000 per month.

As we have previously stated, this study intends to contribute to research on CVM. More in particular, it strives to ascertain whether the method is appropriate for a survey population of students. If income is not a significant explanatory variable, we may conclude that CVM should not be used for target groups of students with imposed incomes. If, on the other hand, income is shown to be a significant explanatory variable, this may be seen as an indication that it is feasible to apply the method in student surveys. However, in order to obtain certainty that this is the case, one would ultimately need to compare elicited WTP with real payments, which is of course impossible.

### ***Order bias***

As was explained in the introduction, the main purpose of the study was to establish WTP for the standard drug and compare it with WTP for the new drug. However, some authors have found that the order in which questions are put to respondents can influence WTP (Carson, 1998; Kahneman, D. and Knetsch, J., 1992; Carson et al., 1995; Stewart et al. 2002, p.585-599). Stewart et al. conducted a purely methodological study aimed at establishing whether ordering effects exist. To this end, they determined WTP for three healthcare programmes using a split-sample technique, whereby the questions were put to the various subsamples in a different order. They found that ordering effects existed.

Order bias was also a methodological issue in the present study. Likewise, we applied a split-sample technique to determine whether the order in which the drugs were presented to respondents influenced their WTP. Half of the students were given a questionnaire in which the standard medicine was described before the new drug. The others were introduced to the medicines in the reverse order. We hypothesised that order would indeed influence WTP.

### ***Data analysis***

The data retrieved from the questionnaires was processed by means of SPSS for windows 10.0. First, descriptive statistics was used to derive the mean, median and mode of both the socio-economic variables and the WTP variables. Subsequently, we determined whether residuals were

normally distributed, as the Ordinary Least Squares technique (OLS) requires. To this end, we conducted a Kolmogorov–Smirnov normality test. It showed that the residuals were not normally distributed, that is why non-parametric tests were used to test the actual hypotheses.

We began with a content-related test in which we examined whether or not the respondents were prepared to pay significantly more for the new, improved drug than for the standard drug. By means of a Wilcoxon Signed Rank Test, we first compared the ‘yes, definitely’ answers for the standard drug and for the new drug. Then the ‘yes, probably’ answers were compared in the same manner.

Subsequently, we conducted a number of tests relating to methodological aspects of CVM.

The first of these tests establishes whether income is a significant explanatory variable, which is crucially important in a CV study. If income is not significant, the results of the survey should be considered invalid or unreliable. In the context of the present research set-up, the test for significance of income provides an indication of whether it is feasible to use students with an imposed income in a CV study. If income is shown to be a significant explanatory variable, the implication is that the students were able to imagine themselves as the head of a household and that they had insight into their spending capacity given their (imposed) income. In other words, it would imply that it is feasible to use students in a CV-study. If, however, income is found not to be a significant variable, imposing an income on a survey population of students should not be regarded a reliable method. The significance of the income variable was examined using a Kruskal-Wallis Test and a Mann-Whitney U Test.

Next, we tested the hypothesis that the order in which the drugs are presented to respondents is a significant explanatory variable. This was also done by means of a Mann-Whitney U Test.

As evidence was found that order is indeed important, we carried out some additional tests to compare WTP for the respective drugs i) when they are described first, and ii) when they are described second. To this end, we simulated a situation in which half of the questionnaires relate to the standard medicine only and the other half concern the new drug only. Subsequently, the respective WTP for the treatments was compared.

Finally, we ascertained whether respondents’ familiarity with ADHD, knowledge of children suffering from the disorder, or awareness that those children were on drug treatment for the disorder influenced their WTP. It was hypothesised that familiarity with ADHD or knowledge of

children with the disorder would increase WTP. Again, this hypothesis was tested using Mann-Whitney U Tests.

## **Results**

The survey was presented to the students during a lecture. Consequently, the response rate was 100%. Only 4 out of the 114 students failed to complete the questionnaire adequately. All analyses described below were performed on the 110 remaining forms. Nineteen of the respondents indicated that they were willing to pay an infinite amount for the welfare of their (future) child, which represents a problem if one wants to calculate average WTP. The responses of these 19 students were processed in two ways. Under the first imputation method, the imposed income of the 19 respondents was reduced by deducting costs for housing, food and clothing, and the remaining amount was taken as their WTP. Under the second method, the maximum amount on the payment card (€75) was regarded as their WTP. The latter approximation has been proposed by a number of authors (Appel et al., 1990, p.327; Donaldson et al., 1995, p.442). The mean age of the respondents was 21.6 years and there were slightly more female (54%) than male respondents (46%). Most of the students were not familiar with ADHD (66%). Just 15% knew children affected by the disorder, but most of these respondents were not aware (89%) of whether or not these children were on medication.

Descriptive statistics of WTP variables are shown in table 1. Using the first approximation for the infinite WTP-values<sup>2</sup>, we find that a student is, on average, “definitely” willing to pay € 273.74 and “probably” willing to pay up to € 290.69 per month for the standard medicine. For the new, improved drug, a student is, on average, “definitely” willing to pay a monthly sum of € 317.06 and “probably” € 330.22. Using the second approximation, we find that a student is, on average, “definitely” willing to pay € 57.35 and “probably” € 74.30 for the standard medicine. For the new, improved drug, a student is “definitely” willing to pay € 81.96 per month and “probably” € 95.12. Under both approximations, the average WTP for the new drug is higher than that for the standard drug. However, there is a substantial difference between the figures obtained under the first and the second method respectively. Under the first approximation, values are about four to seven times higher than the median value, which seems unrealistic. Therefore, only the second approximation is used in the analyses.

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<sup>2</sup> First solution: income reduced by costs for housing, food and clothing.  
Second solution: the maximum amount of the payment card = € 75

Median values are not influenced by extreme values. Under both methods, ‘definite’ median WTP amounts to € 40 for the standard drug and € 75 for the new drug, while ‘probable’ median WTP values are € 75 for either drug.

Table 1: Descriptive Statistics of Definite and Probable WTP (in Euro), Using Two Different Imputation Methods for Infinite WTP

		Standard drug		New drug	
		Definite WTP	Probable WTP	Definite WTP	Probable WTP
<b>1<sup>st</sup> method</b>	Mean	€ 273.74	€ 290.69	€ 317.06	€ 330.22
	Median	€ 40.00	€ 75.00	€ 75.00	€ 75.00
	Mode	€ 25.00	€ 75.00	€ 75.00	€ 75.00
<b>2<sup>nd</sup> method</b>	Mean	€ 57.35	€ 74.30	€ 81.96	€ 95.12
	Median	€ 40.00	€ 75.00	€ 75.00	€ 75.00
	Mode	€ 25.00	€ 75.00	€ 75.00	€ 75.00

Next, we established that the residuals were not normally distributed, so that we transformed the data using a logarithmic transformation. However, a Kolmogorov-Smirnov test showed that, despite this transformation, the residuals were still not normally distributed. Other transformations yielded similar results. In view of this non-normality, we used non-parametric tests to test subsequent hypotheses.

For the sake of clarity, we have drawn up a table that provides an overview of the variables compared in each of these subsequent tests.

Table 2: Overview Table

	First medicine		Second medicine	
	Description standard drug	<i>WTP standard drug<sub>1</sub></i>	Description new drug	<i>WTP new drug<sub>2</sub></i>
<b>Group 1</b> <i>n = 55</i>	Description new drug			<i>WTP standard drug<sub>2</sub></i>
<b>Group 2</b> <i>n = 55</i>	Description standard drug			<i>WTP standard drug<sub>1</sub></i>

We began by applying a Wilcoxon Signed Rank Test to ascertain whether there is a significant difference in WTP for the standard drug and the new drug respectively. In other words, we compared WTP standard drug<sub>1</sub> and<sub>2</sub> with WTP new drug<sub>1</sub> and<sub>2</sub> (see Overview Table).

First, the test was carried out for 'definite' WTP. The results are presented in Table 3 (definite - pooled). It emerges that, in 71 out of the 110 cases, WTP for the new drug is higher than WTP for the standard drug. Consequently, we may conclude that WTP for the new drug is significantly higher than WTP for the standard drug among the 'definite' answers.

The same test was executed for 'probable' WTP (Table 3, probable - pooled). Again, there is a significant difference in WTP. On this basis, we may safely conclude that respondents are prepared to pay more for the new drug than for the standard drug.

Table 3 : Comparing WTP for the standard drug and the new drug

		<b>N</b>	<b>p-value(*)</b>
Definite – pooled	new < standard	6	0.000
	new > standard	71	
	new = standard	33	
Probable – pooled	new < standard	5	0.000
	new > standard	50	
	new = standard	55	
Definite – first only	new < standard	21	0.551
	new > standard	31	
	new = standard	3	
Probable – first only	new < standard	22	0.857
	new > standard	24	
	new = standard	9	
Definite – second only	new < standard	9	0.000
	new > standard	40	
	new = standard	6	
Probable – second only	new < standard	10	0.000
	new > standard	36	
	new = standard	9	

(\*) Wilcoxon Signed Rank Test

In the next test, we ascertain whether or not income significantly influences WTP.

As three different categories of income were imposed upon students a Kruskal-Wallis Test was performed. The results are presented in Table 4.

Table 4: Kruskal-Wallis Test for Three Income Categories

		<b>Income</b>	<b>N</b>	<b>p-value</b>	
Standard drug	Definite	€ 2000	33	0.136	
		€ 2500	39		
		€ 4000	38		
	Probable	€ 2000	33		0.093
		€ 2500	39		
		€ 4000	38		
New drug	Definite	€ 2000	33	0.277	
		€ 2500	39		
		€ 4000	38		
	Probable	€ 2000	33		0.463
		€ 2500	39		
		€ 4000	38		

It transpires that income only has a significant effect on 'probable' WTP for the standard drug. However, the difference between a monthly income of respectively € 2000 and € 2500 is much smaller than that between respectively € 2500 and € 4000. For this reason, a new variable was constructed: € 2000 and € 2500 were pooled, so that just 2 income categories remained. Subsequently, a Mann-Whitney U test was performed. The results are presented in Table 5.

Table 5: Mann-Whitney U Test for Two Income Categories

		<b>income</b>	<b>N</b>	<b>p-value</b>
Standard drug	Definite	€ 2000 and € 2500	72	0.050
		€ 4000	38	
	probable	€ 2000 and € 2500	72	0.045
		€ 4000	38	
New drug	Definite	€ 2000 and € 2500	72	0.226
		€ 4000	38	
	probable	€ 2000 and € 2500	72	0.215
		€ 4000	38	

It now emerges that income is a significant explanatory variable for both 'probable' and 'definite' WTP for the standard drug. This means that respondents take their hypothetical income into consideration when indicating WTP for the standard drug, but not for the new drug.

Subsequently, the hypothesis was tested that the order in which the drugs are presented is a significant explanatory variable for WTP. To this end, we compared WTP standard drug<sub>1</sub> with WTP standard drug<sub>2</sub> as well as WTP new drug<sub>1</sub> with WTP new drug<sub>2</sub> (cf. Table 2: Overview

Table). This was done by means of a Mann-Whitney U Test. The results are presented in Table 6.

Table 6: Mann-Whitney U test on order bias

		<b>p-value</b>
Standard drug	Certain	0.053
	probable	0.013
New drug	Certain	0.020
	probable	0.067

For each of the WTP variables, significant results were found. This means that the respondents' WTP for a drug varies according to whether that drug is introduced first or second. The order 'standard drug - new drug' yields the highest WTP for both medicines.

As order bias is a very important issue in our study, we performed two further tests in this respect. We wanted to ascertain whether there was a significant difference in WTP for the two drugs if one only takes into account responses where the respective drugs were described first. To this end, we performed a Wilcoxon Signed Rank Test. Then, the same procedure was followed for responses where the respective drugs were described second.

In other words, we first compared WTP standard drug<sub>1</sub> with WTP new drug<sub>1</sub>, and we then compared WTP standard drug<sub>2</sub> with WTP new drug<sub>2</sub> (cf. Table 2: Overview Table). The results of these comparisons can be found in Table 3.

On the basis of this table, we may conclude that there is no significant difference in WTP for the standard drug and the new drug if they were described first to the respondents, but that there is a significant difference if they were described second.

Finally, we tested the hypotheses that, if respondents were familiar with ADHD, if they knew children affected by the disorder, or if they were aware of children who are on treatment drugs, this would influence their WTP. To this end, we performed Mann-Whitney U Tests. It was demonstrated that none of the above variables has a significant impact on respondents' WTP. This result is counterintuitive, as one would expect awareness of the disorder on the part of respondents to result in a higher WTP.

## **Discussion**

The purpose of the present study was to contribute to research on the validity of the Contingent Valuation Method in relation to healthcare, an area where, despite a growing literature, many methodological problems remain. More in particular, the present study considers WTP of students for two treatment drugs for ADHD. In this context, two methodological issues are addressed. First, we consider whether it is feasible to apply the Contingent Valuation Method to a survey population consisting of students. Clearly, the relationship between income and WTP is a very important aspect of the Contingent Valuation Method, as a respondent's WTP is inevitably constrained by his or her budget: the higher the respondent's income, the higher one would expect WTP to be. However, as our respondents are (incomeless) students, an income was imposed. The hope was that the respondents would be able to put themselves in the position of a household head and state a realistic WTP given their imposed income. It is a minimum requirement for any CV study that income is a significant explanatory variable for WTP.

The results show that the students' imposed income is indeed a significant explanatory variable for WTP for the standard drug, but not for the new drug. This is not a favourable outcome in the context of a CV study, as findings are only considered to be valid and reliable in this type of research if the income variable is significant. There is, however, a mitigating circumstance: as we used imposed incomes, it may have been difficult for the students to estimate how much of their monthly income they could realistically spend on medicines. Further studies might attempt to better describe to the respondents their financial position.

A previous study by Krabbe et al. also used imposed incomes and the results obtained were similar. In this study, a number of methods for valuing health states were compared. Willingness to pay emerged as the least appropriate method. The authors did not impute this directly to the fact that the survey population consisted of students, but they argued more generally that WTP is only valid in real-life situations and is not suitable under experimental conditions. Indirectly, however, this is of course a consequence of working with students, as they generally have no real income.

We may conclude, then, that using students in a CV-study is interesting merely from a methodological point of view. In subsequent research of this kind, one could take different approaches to trying to resolve the income problem and examine whether results improve or deteriorate. However, we would not recommend that CV with students be used in other than methodological studies. More reliable and valid results can be obtained through surveys of patients or the general population.

The second methodological issue under consideration was whether or not the order in which the drugs are presented influences WTP. Our findings suggest that the order of presentation is indeed important. Students state a higher WTP for either drug if the standard drug is presented first. The significance of the variable ‘order’ is not a favourable result in the context of a CV-study, but it can be explained. Two drugs were presented to the students: the standard drug and a new, improved drug. From the descriptions of the two treatments, the students could obviously derive that the new drug was better than the standard drug, which they use as a point of reference. Under these circumstances, it is quite understandable that respondents are willing to pay more for either drug. After having been introduced to the standard drug first, students are willing to pay to help their children. Then, after having been introduced to the new drug, they are naturally willing to pay more for this improved treatment. If this order is reversed, i.e. if they are introduced first to the most potent drug, they will obviously not display great WTP for the inferior treatment. In other words, what we have here is an understandable yet unfavourable situation, as order should never influence WTP in a CV-study.

Two further tests were performed. In the first test, we only considered responses relating to the drug that was described first. We found that, if described first, there is no difference in WTP for the standard and the new treatment. This can be explained in two ways. On the one hand, it may be due to a “warm glow” effect: people are willing to pay a certain amount to help others (in this case, their children) and this gives them a good feeling about themselves. On the other hand, altruism may also come into play: people are willing to pay purely for the welfare of their children, and there is no self-interest involved. In both these explanations, the efficacy of the drug is unimportant, and therefore WTP for either drug is similar. A mitigating circumstance, however, is the fact that most students were unfamiliar with ADHD or how it is treated. In other words, the students lack a reference point, so that it is quite understandable that they display no difference in WTP for the respective drugs if one only takes into account responses for the drug that was described first.

In the second test, we only considered responses relating to the drug that was described second. The results of this second test indicate a different bias. In this instance, the difference between WTP for the standard drug on the one hand and for the new drug on the other is statistically significant. Again, this is easily explained. When answering questions regarding the first drug, the respondent states an arbitrary amount. But when the second drug is introduced, he/she will use the amount stated for the first drug as a point of reference. If the second treatment is better, it

follows that they will indicate a higher amount; if it is not, WTP will be lower. This phenomenon is referred to as order bias, which can be a problem in CV-studies.

In sum, warm glow and genuine altruism may influence responses to questions regarding WTP for the first-mentioned medicine, while order bias seems to affect the answers to questions regarding WTP for the second-mentioned drug.

A paper by Stewart et al. confirms the existence of ordering effects in CV studies of healthcare. However, it puts forward a somewhat different explanation. The authors argue that ordering effects exist because of a fading glow effect. They assert that respondents tend to receive warm glow or moral satisfaction from contributing to a publicly financed good and that the first programme in the sequence is likely to capture the bulk of this moral satisfaction. Consequently, respondents are willing to pay more for the first programme than for subsequent two healthcare programmes considered in the study.

Stewart et al. also found that people with experience of the programmes were not influenced by the order of presentation in stating their WTP. By contrast, in our own study, knowledge of ADHD was found to be of no influence for respondents' WTP.

These conflicting results and explanations indicate that further research on ordering effects is called for, particularly as both studies conclude that such effects exist. This already raises questions about the appropriateness of CV as an aid in resource allocation in healthcare. Certainly policymakers should be made aware that, when respondents are asked to evaluate multiple programs, their stated WTP is likely to be influenced by the question order.

To obtain more valid WTP responses, one should not compare multiple programs or medicines but stick to one program or medicine. Otherwise, one will have to deal with order bias.

In addition to the research questions relating to methodological issues, we also tested whether the students were prepared to pay more for the new drug than for the standard medicine, irrespective of the order in which the drugs were presented. We were able to establish the average WTP for both medicines, and it transpired that students were willing to pay significantly more for the new, improved medicine than for the standard drug. However, most students undeniably lack a genuine income. Therefore, in order to obtain more reliable results, we feel the questionnaire should be put to the general population or to parents of children suffering from ADHD.

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