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THE INTRINSIC VALUE OF THE INFORMATION CONTAINED IN MEDICINE LEAFLETS

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Abstract

This paper applies contingent valuation methodology to estimate the monetary value of the information contained in medicine leaflets. By surveying a sample of the general population, we obtain willingness-to-pay estimates of the value of providing additional quantitative information on potential benefits and side effects of a hypothetical medicine, according to the best evidence available about risk communication. The willingness-to-pay estimates found in our study ranged from 60 cents to 1 euro per month. In addition, some consistency tests of the robustness of our estimates are also presented, as well as evidence on their feasibility, reliability and validity.

Keywords: Contingent valuation, willingness to pay, patient information leaflets, risk communication.

JEL: I10, I12, I18

1. Introduction

Standard economic theory (and health economics as well) conventionally assumes that the final outcomes of the different alternatives are the sole determinants of value for individuals. Consequently, benefits of health interventions are usually identified only with the health gains they produce.

Nevertheless, health interventions may also yield utility for patients because of what Donaldson and Shackley (1997) call "process" attributes (i.e., attributes not strictly related to health but that impact individual well-being as well). One example would be better convenience of a medication regimen. Another could be the value of patient information leaflets that accompany prescription drugs. Precisely, this is the main aim addressed in this paper: to estimate the intrinsic value that people attribute to information about medication contained in the leaflets.

As is well known, the contingent valuation (CV) methodology is a survey-based approach rooted in applied welfare economics used to assign a monetary value to non-market goods such as the one (i.e., value of patient information leaflet) we are interested in this paper (Mitchell and Carson, 1989). Typically, that value is approximated by eliciting willingness to pay (WTP) or willingness to accept (WTA) estimates from respondents. Although this method has been extensively used to evaluate health treatments and, moreover, to evaluate how levels of information impact WTP for health programs (e.g., Donaldson & Shackley, 1997; Pinto et al., 1998; Protiere et al., 2004; Shono et al., 2014; Dealy et al., 2017), there is just one study to date (Dealy et al., 2021) that has attempted to estimate the WTP for the information contained in the leaflets. More specifically, the authors estimated the WTP for changing from non-standardized formats of providing information on uses, side effects and interactions of a medicine to a standardized format.

This paper builds on Dealy et al. (2021) work by going one step further. We also compare two different formats. One of them represents a "traditional" leaflet, similar to the non-standardized formats used by Dealy et al. As in those used by these authors, no quantitative data about efficacy and side effects is provided in our traditional leaflet. The other format employed in our study, however, provides additional quantitative information about potential benefits and harms of the same hypothetical medicine presented in the traditional format. Moreover, that information is given according to the best evidence available about risk communication, depicting it in the form of natural frequencies through a visual aid.

In this respect, there is evidence suggesting that the readability of patient information leaflets (PILs) is frequently too complex for average patients to comprehend fully (Hamrosi et al., 2012). Simplifying language, using natural frequencies rather than percentages for probabilities, and consistency in risk expressions can enhance comprehensibility (Gigerenzer et al., 2007). The framing and formatting of risk information impacts perception. Patients often overestimate the significance of risks when provided relative measures such as "twice as likely" compared to absolute risks or natural frequencies (Sirota & Juanchich, 2019). Nevertheless, presenting risks in the form of frequencies of type, for example, 1/10,000, may be misleading, because such information may trigger different impacts depending on equivalent but superficially different methods of presentation (Pinto et al., 2006). So, to avoid this bias, as Yamagishi (1997) suggests, the specific risk about which we want to inform patients should be presented in comparison to other risks (e.g., a heart attack risk could be presented as a comparison in frequencies of premature deaths due to traffic accident, diagnostic X-rays or tobacco smoking) following a descending order. Furthermore, visual aids are also demonstrated to facilitate patient understanding of risk magnitudes. Pictographs, icon

arrays, and bar charts can allow quicker interpretation of probability data than textual descriptions or percentages alone (Garcia-Retamero & Galesic, 2011). Intermittent bolding of key risk descriptors can help draw attention to important details and visual presentations are also optimally interpreted when arranged in decreasing order of risk magnitude rather than randomly (Sirota et al., 2018). Besides, providing balanced information about side effects and treatment benefits can avoid skewing risk perceptions (Webster et al., 2018). Tailoring visual aids and risk communication approaches to suit health literacy levels and norms in target populations enhances effectiveness (Yi et al., 2015).

On the basis of the previously discussed evidence-based principles for effective risk communication, this paper reports WTP estimates of the value provided by a Spanish general population sample to the information conveyed in a way aligned with such principles through a complementary brochure, additional to the traditional PIL, included in the package of a hypothetical medicine. In addition, some consistency tests of the robustness of our estimates are also presented, as well as evidence on their feasibility, reliability and validity.

The manuscript is organized as follows. First, elicitation methods, survey design, and questionnaires used are described. Besides, the main hypothesis to be tested, consistency tests and statistical methods employed are explained. Next, main findings are presented. The discussion closes the paper.

2. Methods

2.1. General outline of the survey design

A contingent valuation (CV) study was designed to estimate the value of the additional information contained in a complementary brochure to the usual patient information leaflet (PIL) of a hypothetical medicine. This medicine was an anticoagulant indicated for preventing cardiovascular diseases. We chose this drug because it involves a clear trade-off between benefits (preventing heart attacks) and risks (increased susceptibility to gastrointestinal bleeding).

CV surveys elicit individuals' willingness to pay (WTP) using different elicitation formats. However, there are some concerns about biases distorting WTP responses, such as hypothetical biases (i.e., where stated value differs from true value) (Haab et al. 2013) and scope effects (i.e., insensitivity of WTP responses to changes in goods) (Carson, 1997). Aside from these potential biases, which are common to any CV study, applications in the specific context of healthcare present an additional challenge compared to other fields. This challenge arises from the fact that respondents may be reluctant to put "a price" on health, given that it may be perceived as a superior good.

Addressing all these issues requires making a series of careful decisions concerning questionnaire design. In this way, a realistic and comprehensible description of the hypothetical scenario recreated in the survey is necessary. Likewise, a suitable payment mechanism (e.g., price, tax, insurance premium) has to be chosen, as well as the elicitation format (e.g., open-ended, close-ended, payment card) through which WTP responses will be elicited, among other factors. Additionally, it is essential to incorporate supplementary questions into the questionnaire to conduct tests validating the results. Next, all these decisions, applied to our study, are described.

2.2. The sample

The sample comprised 217 adults selected to represent the age and gender distribution within the general population. They were randomly assigned to two distinct groups (n1 = 110; n2 = 107). The questionnaires administered to the subjects in each of the groups were identical, except for the section inquiring about their willingness to pay (WTP). The survey took place in the region of Murcia, Spain, over a period of 1 month. All the interviews were face-to-face, and the average time per interview was around 20 minutes. A subsample of 20 individuals responded to the questionnaire a second time, 15 days after their initial interview, to evaluate the test-retest reliability of their responses.

2.3. The questionnaire

The questionnaire was structured in four parts. First, the study was introduced to the participants. Next, throughout the second part of the questionnaire, the nature of myocardial infarction—the disease that the anticoagulant medication is intended to prevent— and the consequences of gastrointestinal bleeding associated with that medication were explained to participants with the help of the visual aids provided in the Appendix.

Part 3 of the questionnaire contained WTP questions. Prior to asking these questions, two different, though complementary, pieces of information on the anticoagulant medicine and its consequences were presented to the participants. The first piece of information (Figure 1) was a “traditional” leaflet, and the latter one (Figure 2) a brochure providing additional quantitative information on the effectiveness and side effects of the medicine. As noted in the Introduction, the design of this complementary brochure responds to best practices on risk communication reported in the literature, particularly Yamagishi’s (1997) recommendations for effective risk communication.

Once both the PIL and the complementary brochure were shown to the respondents, they were asked to state their maximum WTP for the medicine in different ways depending on the group to which they belonged, as explained further in the next section. The payment scenarios involved a monthly payment for a year. To make the WTP questions plausible and avoid protest responses (i.e., stating a zero bid or refusing to state a bid), we strived to justify the absence of public financial coverage for the drug by emphasizing its preventive nature. So, the participants were informed that there was another medicine funded by the public system specifically for people who have heart disease. Additionally, interviewers were briefed on the possibility of encountering these types of responses and their role in making the scenario credible, as well as addressing any initial reluctance some respondents may have.

[Insert Figures 1 and 2 about here]

The last part of the questionnaire (Part 4) included a set of questions aimed firstly at gathering sociodemographic information (i.e., gender, age, marital status, educational attainment, employment status, and income level). Some of these variables were included to examine potential effects on the responses. Notably, income level values were used to assess whether WTP estimates increased with income, one of the tests that CV results have to pass to claim their construct (Carson and Mitchell, 1989) or theoretical validity (Bateman et al., 2002), i.e., that WTP responses agree with expectations predicted by economic theory. Some other questions also inquired about the participants' previous experience with health problems such as heart attacks and gastrointestinal bleeding. Finally, a series of questions gauged the interviewee's comprehension of essential questions related to the health issues under consideration and assessed their numerical skills, specifically their ability to convert frequencies expressed in different formats. The

specific ability to compute proportions, percentages or probabilities is often referred to as statistical numeracy (Cokely et al. 2014), being one of the drivers of risk literacy (i.e., the ability to accurately interpret and act on information about risk). So, the inclusion of these questions in our CV survey allowed us to check out whether statistical innumeracy influenced WTP estimates.

Responses to all these questions were incorporated as independent variables into the different econometric models used to examine the influence of sociodemographic, economic, and personal traits as potential determinants of the estimated WTP for the information and the medicine. Likewise, as noted above, it also served to check whether WTP estimates conform to the predictions of economic theory.

2.4. Willingness to pay questions: elicitation procedure

As mentioned above, the questionnaires administered to the subjects in each of the groups were identical, except for how they were asked about their WTP. In Group 1, participants first stated their WTP for the medicine whose package only included the traditional leaflet, and then stated their WTP for also including the brochure containing detailed information on the anticoagulant's benefits and harms within the package. Thus, they valued the medicine and the complementary information provided by the brochure separately. On the contrary, in Group 2, participants stated their maximum WTP for the medicine package as a whole, including both the PIL and the complementary brochure. Afterwards, respondents belonging to Group 2 were asked to indicate the proportion (as a percentage) of the total WTP they had previously stated that was attributed exclusively to the additional information provided in the brochure.

This different procedure to estimate the value of the information served to test the consistency of the results across the two groups in a twofold sense. On the one hand, it allowed us to test if the different response format used in each group (i.e., a money amount in Group 1 vs a percentage over the overall WTP for the whole medicine package in Group 2) to elicit the values for information led to a significant discrepancy between their WTP estimates. On the other hand, it made possible to test whether a 'part-whole' effect (Bateman et al., 2006, 2007) occurs, i.e., whether the sum of the WTP for the medicine and the WTP for the brochure, when valued separately as they were done in Group 1, was larger than the WTP placed on the medicine package including the brochure as a whole, such as was performed in Group 2.

To elicit WTP values a mixed format was adopted, combining a payment card method with an open-ended question. First, respondents indicated if they would pay or not each of the different amounts shown on the payment card (Figures 3 and 4) to narrow the range of possible WTP values, and then they specified their definitive WTP through an open-ended question. This format, first used by Carthy et al. (1999), has also been employed by Sánchez-Martínez et al. (2021) to elicit the value of a statistical life, showing a reasonable balance between preference elicitation feasibility and accuracy of responses.

[Insert Figures 3 and 4 about here]

To facilitate participants in Group 2 stating the percentage of their WTP for the medicine package attributed to the complementary brochure included in the package, a visual analogue scale (VAS) resembling a graduated thermometer ranging from 0 to 100 was used.

2.5. Hypothesis testing and internal consistency

The central hypothesis we aim to test posits that individuals assign a positive value to the availability of information about the benefits and side effects of medicines. Besides testing this key hypothesis, in parallel we also check out the internal consistency of our findings or, as Kling et al. (2012) argue, the extent to which stated preferences are consistent with theoretical expectations (construct validity).

Therefore, we first test the following hypothesis:

> ***Main hypothesis****: The WTP for receiving quantitative information on the effectiveness and side effects of the medicine (the brochure) will be significantly greater than zero.*

This hypothesis will be supported if, denoting WTP $(i)^1$ as the WTP for the complementary brochure directly stated by participants in Group 1 and WTP $(i)^2$ as the WTP attributed to the same brochure in Group 2, the following conditions are met:

$$WTP\ (i)^1 > 0$$

$$WTP\ (i)^2 > 0$$

Since respondents in Group 2 are not directly asked to state their maximum WTP, but rather they are asked to set the percentage representing the value of the information regarding the WTP for the total cost of the medicine, which includes the additional information, WTP $(i)^2$ is calculated as the product:

$$\%\ WTP\ (i)^2 \times WTP\ (m/i)^2,$$

Where % WTP $(i)^2$ denotes the percentage that represents the value of the information and WTP $(m/i)^2$ the WTP for the drug, including the information.

In addition, as noted above, our split-sample design allows us to test the internal consistency of our CV survey by addressing two potential anomalies in stated preferences. Firstly, we will examine whether the different response format used to elicit

WTP values for the brochure in each group will lead in turn to different WTP estimates. Elicitation effects are recognized as being related to violations of the principle of procedure invariance (Tversky et al., 1988), whose image in CV studies is the persistent finding that the response format systematically affects reported WTP values (Poe, 2016). In our case, testing for elicitation effects implies to compare the WTP for the information elicited in isolation from Group 1 to the WTP for the information inferred from applying the percentage attributed by respondents in Group 2 to the stated WTP for the whole package. In consequence, if elicitation effects are present in our data then the value assigned to the brochure will not be independent on the response format, which implies:

$$\text{WTP (i)}^1 \neq \text{WTP (i)}^2$$

Which means in turn that:

$$\text{WTP (i)}^1 \neq \text{\% WTP (i)}^2 \times \text{WTP (m/i)}^2$$

Lastly, we will examine whether there are significant differences between, on the one hand, the sum of the WTP elicited for the medicine and the complementary brochure separately (Group 1) and, on the other hand, the overall WTP for the entire medicine package including the brochure (Group 2). So, we propose to test for 'part-whole' effects, one of the anomalies involved into the so-called embedding effects (Kahneman and Knetsch, 1992). Within embedding effects there is room for ordering effects, scope insensitivity, visible choice-set effects and part-whole/substitution effects (Bateman et al., 2006, 2007). The latter anomaly occurs in the context of CV studies when it appears that the sum of the valuations placed by respondents on the parts of a good is larger than the valuation placed on the good as a whole. Transferring this to our survey, if there are part-whole effects in it then:

$$\text{WTP (m)}^1 + \text{WTP (i)}^1 > \text{WTP (m/i)}^2,$$

where WTP (m)[1] represents the WTP for the medicine elicited in Group 1.

2.6. Statistical methods

To test the key hypothesis of the paper, i.e., whether WTP for the complementary brochure is significantly greater than zero, both the parametric one-sample *t*-test and the non-parametric one-sample Wilcoxon signed-rank test will be used. Likewise, we will try to identify the main determinants of the WTP for the complementary brochure by means of a two-step econometric strategy. Firstly, an ordinary least squares (OLS) regression analysis, using different specifications, will be performed. Percentages attributed to the value of the additional information contained in the brochure will be converted to euros as explained above, by multiplying the proportion of the overall WTP for the whole medicine package (including the brochure) that respondents assign to the additional information times that overall WTP. Next, in case that WTP values are far from a normal distribution, a censored model (Tobit model) will be estimated.

Consistency of WTP responses will be also analysed by using both regression analysis and, in this case, two-sample statistical tests. In this way, to check whether the value of the additional information contained in the brochure is not independent of the elicitation format used (separate valuation vs. valuation "implicit" in the overall value for the medicine, including the brochure), a dichotomous variable capturing whether the respondent answered questionnaire 1 or 2 is included as a regressor (see Table 1). Additionally, WTP estimates obtained in both formats (WTP for the complementary brochure, in the first case, and the percentage attributed to the additional information multiplied by the WTP for the whole medicine package, in the second one) are compared using both the unpaired *t*-test and the non-parametric Wilcoxon-Mann-Whitney (WMW) test.

Likewise, testing for 'part-whole' effects is performed through another regression analysis, including newly the questionnaire type as an independent variable. To ensure homogeneity between the observations from both groups, estimates used for Group 1 in the analysis are those obtained by combining the two types of WTP values (i.e., for the medicine itself and for the additional information). Conversely, for Group 2, the WTP for the whole medicine package (including the complementary brochure) is used. This analysis is supplemented by comparing WTP estimates elicited from Group 2 to the sum of the two types of WTP estimates (i.e., for the medicine and the complementary brochure) elicited from Group 1 using both parametric and non-parametric tests.

[Insert Table 1 about here]

Table 1 provides a brief description of all the explanatory variables included in the different econometric specifications that will be considered. The first group of variables corresponds to the sociodemographic characteristics of the subject: gender, marital status, age (including its square, considering the possibility of non-linear effects), and level of completed education. Age is also included as a discrete variable in order to test a potential "pensioner effect" for the WTP for the medicine. Such an effect is the label given to describe the reluctance that population aged 65 and over (mostly pensioners) can feel toward paying a higher WTP, since what they usually pay for medicines, due to the co-payment structure in Spain, is lower than working-age population do. The inclusion of income among the explanatory variables in the different regressions that will be performed will serve to test if WTP correlates well with income, so a positive and significant income coefficient is to be expected. Likewise, a variable has been included to capture the numerical skills of the respondent, specifically their ability to convert risks expressed in terms of 10,000 to risks expressed as percentages. Those who answered both

questions of this type correctly in the survey were considered mathematically 'competent.' Additionally, two dichotomous variables accounting for prior experience with heart attacks and digestive bleedings, respectively, has been included, along with the variable capturing the group to which the respondent belongs.

Finally, a test-retest reliability analysis will also be conducted, for which Pearson and Spearman correlations will be calculated. A high Pearson correlation (close to 1) signifies strong linear agreement between initial and retest scores, while a high Spearman correlation indicates consistent monotonic agreement.

3. Results

3.1. Characteristics of the sample

Table 2 shows main features of the sample and the two groups than comprise it. Roughly speaking the sample is representative of the Spanish general population.

[Insert Table 2 about here]

3.2. Willingness to pay estimates

In Group 1, all the participants stated a positive WTP value for the complementary brochure. However, the same did not happen for respondents in Group 2, where a total of 35 interviewees assigned a zero WTP value for the complementary brochure medicine.[1] Nevertheless, as it is shown in Table 3, despite these zero values, mean WTP in Group 2 was positive and larger than that obtained in Group 1. Both parametric and non-

[1] Indeed, there were 34 participants who, having stating a positive WTP value for the whole medicine package (including the complementary brochure), then set a null percentage over that value onto the VAS. The remaining participant until amount the 35 respondents who did not provide any value to the complementary brochure was the only participant in the whole sample who was not willing to pay anything for the medicine.

parametric tests suggest that WTP estimates in the two groups are significantly different from zero (one-sample *t*-test and one-sample Wilcoxon signed-rank test, $p < 0.0001$), supporting in this way hypothesis 1.

[Insert Table 3 about here]

As noted in the Methods section, we conducted an OLS regression analysis of the determinants of the WTP for the complementary brochure. Different OLS estimations have been performed by changing the regressors in each of the models 1 to 3 in Table 4. Additionally, since WTP figures are far from a normal distribution (see Graph A1 in the Appendix), a censored model (Tobit model) has also been estimated. To perform these analyses, WTP estimates elicited from Group 2 were previously converted to euros, as indicated at the bottom of Table 3.

[Insert Table 4 about here]

The figures in Table 4 suggest a positive relationship between age and WTP, and this relationship also appears to be nonlinear. The significance and negative sign of the Age^2 coefficient in models 1 to 3 indicate an inverted U-shaped relationship between WTP and age, similar to the age-wage profiles observed in the labour market. This suggests that the age variable may partially capture the income effect. The income variable also proves to be statistically significant, thereby confirming the theoretical validity of the questionnaire in this respect, as we will discuss later. Educational levels are non-significant, even when, considering the possibility of a high correlation between education and income, the variable income is omitted (model 3). Other variables such as prior experience with heart attack and digestive bleeding, or the mathematical competence of the subjects turned out

to be non-significant too. The results of the censored model are qualitatively similar to those of the OLS regressions.

Table 4 apparently indicates that the way in which WTP for additional information was obtained (as a separate WTP question in group 1 or as a proportion of the overall WTP for the medicine in questionnaire 2) affects WTP values. The positive and statistically significant coefficient of the 'Questionnaire type 2' variable in all models suggests that determine the WTP for the complementary brochure as a percentage of the overall WTP for the medicine makes that the value conferred to the additional information is higher, such as Table 3 indeed shows. Notwithstanding, though a significant difference between the WTP estimates provided in both groups is found with the unpaired *t*-test ($p = 0.0052$), significance is not reached according to the non-parametric WMW test ($p = 0.11$).

Table 5 presents the results regarding the WTP for the medicine elicited from both groups. It is apparent that mean values are very similar in the two groups.

[Insert Table 5 about here]

Results from the OLS regression analysis performed for explaining the WTP for the medicine is shown in Table 6. It is observed, in a similar way to the case of the WTP for the additional information, the presence of an inverted U-shaped relationship between WTP and age, likely reflecting the impact of the income variable, which, once again, holds significance in explaining the dependent variable. When the age variable is introduced in the model in the form intervals (see model 4 in the table), a positive and highly statistically significant coefficient ($p < 0.01$) results for the category 35<=Age<50, and a weaker negative effect ($p < 0.1$) for the category “age 65 years or more”. This finding suggests a sort of “pensioner” effect, as was already anticipated in section 2.6,

since people aged 65 and over in Spain mostly belong to the group of pensioners. According to the Spanish co-payment scheme, pensioners usually pay less for medicines than active population, and consequently they may be more reluctant to declare a high WTP for drugs. Moreover, another finding analogue to that reported from the first regression is the lack of significance in the variables related to the interviewee's prior experience with heart attack and gastrointestinal bleeding, and their numerical skills.

[Insert Table 6 about here]

Regarding the influence of the way that the WTP for the whole medicine package is obtained (as the result of a sequence in Group 1 or through a single valuation in Group 2), the regression analysis upholds the neutrality assumption (the coefficient of the questionnaire variable turns out to be not significant), with the single exception of model 4, for which the coefficient is weakly significant ($p < 0.1$). Parametric and non-parametric tests employed to compare the estimates elicited between the two groups cannot reject the null hypothesis, reinforcing the impression that apparently there are no 'part-whole' effect in our data (unpaired *t*-test, p=0.814; WMW test, p=0.863).

3.3. Feasibility, test-retest reliability and validity

Feasibility of the questionnaire was assessed by calculating the percentage of completed questionnaires, i.e., questionnaires in which the interviewee answered every single question. In our study, this was the case for 100% of the respondents.

As noted before, a retest was conducted two weeks after the primary interview. To assess reliability over time, the responses of the 20 subjects (10 from each sub-sample) who participated in the retest were compared with their responses in the initial interview. Results are presented in Table 7 indicating that the level of reliability is quite good for the questionnaire administered in Group 1, but not so much in Group 2.

[Insert Table 7 about here]

Regarding (construct) validity, a key theoretical hypothesis for the construct "WTP for the medicine (for the additional information)" is the presence of a positive correlation between the subject's income and their WTP. The results obtained from the regressions presented in Tables 4 and 6 support, in this respect, the theoretical validity of the study. This is evident as the income variable exhibits positive and statistically significant coefficients at the 95% confidence level.

4. Discussion

The primary objective of this study was to estimate the value of information concerning the benefits and harms of medication based on the best available evidence for effective risk communication. In line with this goal, and according to the main hypothesis formulated in the manuscript, participants in our study valued positively to receive quantitative information regarding effectiveness and side effects of a hypothetical anticoagulant medicine. Our study revealed that the willingness to pay (WTP) for the additional information included in a brochure, complementary to a traditional patient information leaflet, ranged from 60 cents to 1 euro per month. Interestingly, our upper value closely aligns with the average WTP ($1.37) for standardized informational leaflets reported by Dealy et al. (2021) for the United States.

The format used to elicit WTP for the additional information significantly influenced our results, suggesting therefore the existence of elicitation effects. In one of the groups (Group 1) in which the total study sample was divided, WTP for the complementary brochure was elicited separately from WTP for the medication itself. In the other group (Group 2), WTP for the brochure was determined as a percentage of the overall WTP for

the entire medication package, including the brochure. Whereas the method used to elicit WTP estimates for both the complementary brochure in Group 1 and the overall WTP for the medicine plus the brochure in Group 2 was a payment card followed by an open-ended question, WTP for the brochure in Group 2 was inferred from the percentage rated onto a 0-100 visual analogue scale (VAS). Our findings clearly indicate that the elicitation format used is not irrelevant, because the mean WTP for the brochure in Group 2 exceeded nearly 60% of the mean WTP elicited in Group 1, even though around one third of participants in Group 2 assigned a zero WTP value to the brochure.

Inspection of the distribution of VAS responses in Group 2 (see Graph A2. in the Appendix) clearly shows that, despite the wide variability of the percentages rated (SD = 3.563), there are two values (5 and 0%) in which a considerable volume of the responses concentrates. In this way, 56 (out of 107) participants fitted 5% as the percentage of the WTP for the whole medicine package that they attributed to the brochure. In contrast, the equivalent percentage (using mean values) that implicitly respondents belonging to Group 1 attribute to the brochure is only 2.6%.

A plausible explanation for this finding comes from the idea that preferences are imprecise, a notion first proposed by MacCrimmon and Smith (1986) to explain preference reversals, then explored further by Butler and Loomes (2007), and that has been also invoked to explain anomalies observed in CV surveys (Dubourg et al., 1994, 1997). The intuition behind this concept is that preferences are (at some extent which varies with the context and task) imprecise by their own, so many respondents in Group 2 would be not sure about the exact percentage to attribute to the brochure, but rather they would have an imprecision interval within which any percentage could represent the relative value to confer to it. As the response scale of the VAS spans from 0 to 100% it is

easy that the imprecision interval contained larger values than 2.6%, in such a way that even if responses' WTP for information was identical to that of Group 1, it is conceivable that they perceived a small value as a figure greater than 2.6%, tending indeed to round up their figure to 5%.

Differences between the two respondents' groups in our study also come from the number of zero WTP values obtained in each of them. There was a complete absence of zero responses in Group 1, while a substantial number of null responses (almost 33%) were recorded in Group 2. This result is somewhat surprising, considering that other studies estimating the value of information in non-health contexts (e.g., Latvala and Kola, 2000) have often reported a significant percentage of zero WTP values. It is conceivable, however, that the severity of the health problem addressed in our study (i.e., myocardial infarction) has encouraged participants to pay for getting additional information, thus explaining the unanimity in the responses in Group 1. Notice that, similarly, just one participant in Group 2 was not willing to pay anything for the medicine, including the complementary brochure. So, again, the key of this disparity points towards VAS responses provided in Group 2.

This sharp asymmetry between the WTP for the brochure of the two groups could be attributed to respondents' attention. It is well established in economic theory (Bordalo et al., 2013, 2016) how emphasizing the importance of some attributes can draw consumer attention to them. In the context of our survey there was a marked difference in terms of the salience of the brochure between the two questionnaires that might have led to some respondents of Group 2 to be unwilling to pay anything for it. Although from the onset respondents in the two groups were provided with a complete description of the medicine and the brochure, they were not told in advance that they will be asked to value each in

turn. In questionnaire 1, once respondents have stated their WTP for the medicine and before they were asked to state their WTP for the information, they were newly informed of the utility of the brochure to be more awareness of the benefits and risks of the medicine intake. In questionnaire 2, however, immediately after of having state the WTP for the whole medicine package, where the salient attribute was the medicine by itself, and without further elaboration, respondents were inquired about the percentage they would place on the brochure. In this regard, probably respondents' attention was directed to the medicine and not to the brochure, making that many of them underweighted the value of the additional information providing a zero WTP value.

Unfortunately, although participants were encouraged to give thoughtful and reflective answers, no cross-check question was included in the questionnaire to get insight about the actual reasons why some respondents refused to set a positive percentage in the VAS task. This limitation should be overcome in further investigations on this issue.

Apparently, there is no trace of a 'part-whole' bias in our data. The overall WTP for the medicine, which encompasses the brochure, did not significantly differed from the sum of the WTP for the medication alone and the WTP for the additional information. This finding is relevant because there is previous evidence of 'part-whole' effects not only with public goods, but also with private goods (e.g., pizza, desserts), such as the goods valued in our survey are (Bateman et al., 1997; Clark and Friesen, 2008).

We can interpret this result as a consequence of a careful survey design. According to Carson and Mitchell (1995) embedding effects found by Kahneman and Knetsch (1992) were mainly caused by the vague and incomplete description of the goods used in the experiment, and especially because the relationships between them were not specified to all respondents. On the contrary, in our survey the full extent of purchase options was

revealed to respondents at the outset. Detailed information on the disease (heart attack) and the side effects (digestive bleeding) of the medicine was described to the respondents, as well as the content of the traditional leaflet and the quantitative information depicted in the brochure. Therefore, at first sight, our attempt to describe accurately the goods under valuation was successful and, accordingly Carson and Mitchell's argument, it could be the reason of the absence of embedding in our survey.

Another perspective more sceptical, however, would be to acknowledge that although in our survey the sum of the part values does not exceed that stated for the whole, it can be due to a sort of composition effect. Strictly speaking a typical part-whole effect occurs when the WTP for the same good when it is valued individually is higher than when the good is valued as part of another more inclusive good (Kahneman and Knetsch, 1992). As saw, mean WTP for the information was significant higher in Group 2 (€1.01) than in Group 1 (€0.63), which is indeed the opposite pattern to that typically reported (Bateman et al., 2006). The implicit mean WTP for the medicine itself in Group 2 (€23.20 = 24.21 – 1.01) is in fact lower than that stated in Group 1 (€24). Therefore, the apparent consistency of the "parts" (medicine and brochure) and the "whole" (the medicine package) hides two effects that offset. This game of communicating vessels results from the application of the VAS mechanism, which, as argued before, may have been able to induce higher valuations through preference imprecision.

The study presented in this paper, while providing valuable insights into the WTP for information about drugs' benefits and side effects, also has several limitations that warrant consideration. Firstly, the sample size utilized in the survey, though sufficient for the specific analysis conducted, may not fully capture the complexity and diversity of preferences within the broader population. Therefore, it has to be recognized that

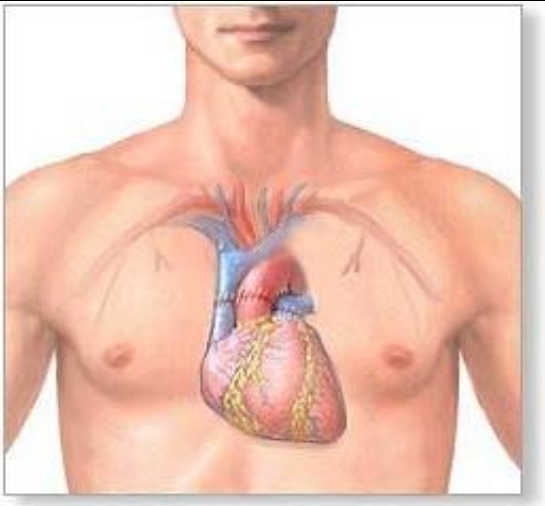
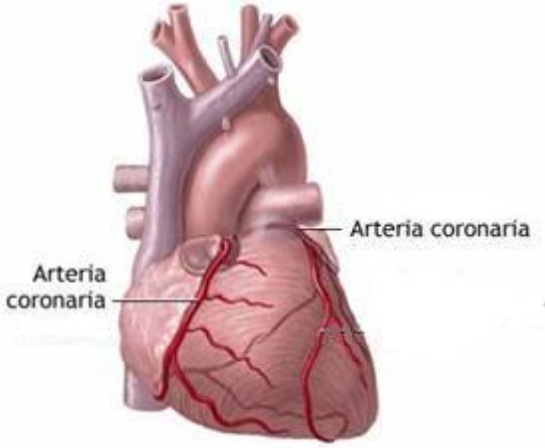
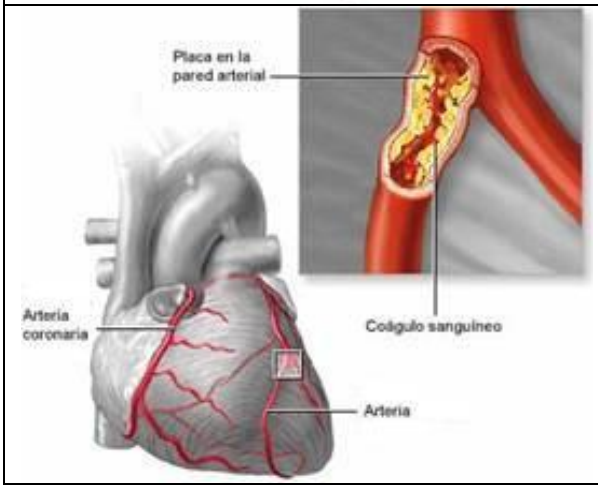
generalizing the findings to the entire adult population of Spain would be overly ambitious. To address this limitation and enhance the robustness of our knowledge on this issue, future research in this area should aim to employ larger and more diverse samples, striving for greater representativeness of the adult Spanish population. Additionally, studies involving actual patients with varying medical conditions and treatment options could provide valuable insights into the practical implications of information valuation in healthcare decision-making. Exploring the dynamics of patient decision-making processes and factors influencing their WTP for medical information in real clinical contexts would be a worthwhile avenue for further investigation.

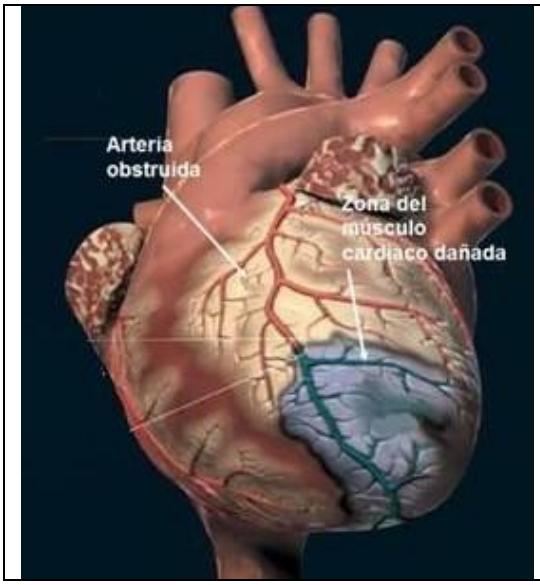
One finding that may at first be surprising, and that could be challenging for the liability of our results, is the high number of subjects lacking numerical skills. We found that just under 36% of the respondents demonstrate sufficient numerical skills to handle small risks, expressed as per 10,000, and convert them into percentages. Notwithstanding, this low percentage is aligned with the findings of previous studies (see Garcia-Retamero et al., 2019 for a review) addressed to test specifically risk literacy. In this vein a paradigmatic study is that conducted by Cokely et al. (2012) who reported results from a test of statistical numeracy and risk literacy (i.e., the Berlin Numeracy Test) administered to highly-educated samples of 15 different countries, Spain amongst them. Just 4% of the Spanish respondents were in the top quartile score, pretty below the average proportion (31%). A similar picture can be extracted from studies testing numeracy in the general population. For example, the first wave of the Programme for the International Assessment of Adult Competencies (PIAAC) study, conducted in 2012, which interviewed over 6,000 Spanish adults (aged 16-65 years), revealed that more than 70% of the respondents had mathematical knowledge at level 2 or lower out of the 5 existing levels (Educainee, 2013).

Despite acknowledged limitations, this paper provides compelling evidence supporting the notion that access to information about the effectiveness and side effects of drugs holds inherent value for the population. Bearing in mind the possibility of extending and improving the study, an interesting implication of the results obtained is that the way of eliciting the value of the information is not irrelevant. In particular, that asking for such value as a percentage of the value of the drug as a whole may generate biased responses, due to imprecision in preferences and/or the appearance of attention effects. It would be also valuable, certainly, to use alternative methodologies to contingent valuation and engaging real patients as well. In this regard, the use of discrete choice experiments, through which process and outcome attributes are differentiated, arises as a promising approach for future investigations.

Appendix

CARD 1
WHAT IS A HEART ATTACK?

	The heart is a composite bag of muscles with veins and arteries that surround it. It is located between the lungs, on the left side of the thorax, and the muscular mass that forms it is known as the myocardium. The heart's primary function is to pump blood to all organs of the body to provide them with oxygen.
	Like any other organ, the heart also requires oxygen to function properly. Oxygen reaches the heart through the blood circulating in the coronary arteries, which encircle the heart like a crown. Proper heart function relies on uninterrupted blood supply from these coronary arteries.
	Over time, fat can accumulate in the arteries for various reasons. If a coronary artery becomes obstructed because of this, the heart does not receive the necessary oxygen. Permanent oxygen deficiency in the heart muscle can lead to a myocardial infarction, commonly known as a heart attack. The severity of a heart attack depends on the part of the heart that is damaged.

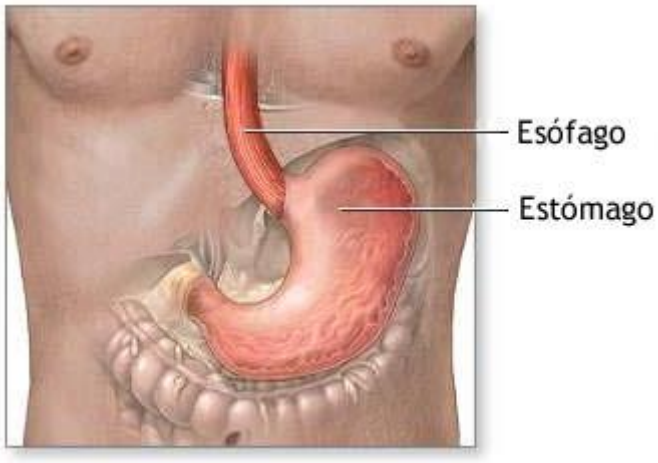


Smaller infarctions have a higher chance of survival.
Survivors of a heart attack typically require lifelong medication, dietary adjustments, and lifestyle changes.
Unfortunately, between a quarter and a third of people who suffer a heart attack die before receiving medical attention, a condition known as sudden death.

CARD 2

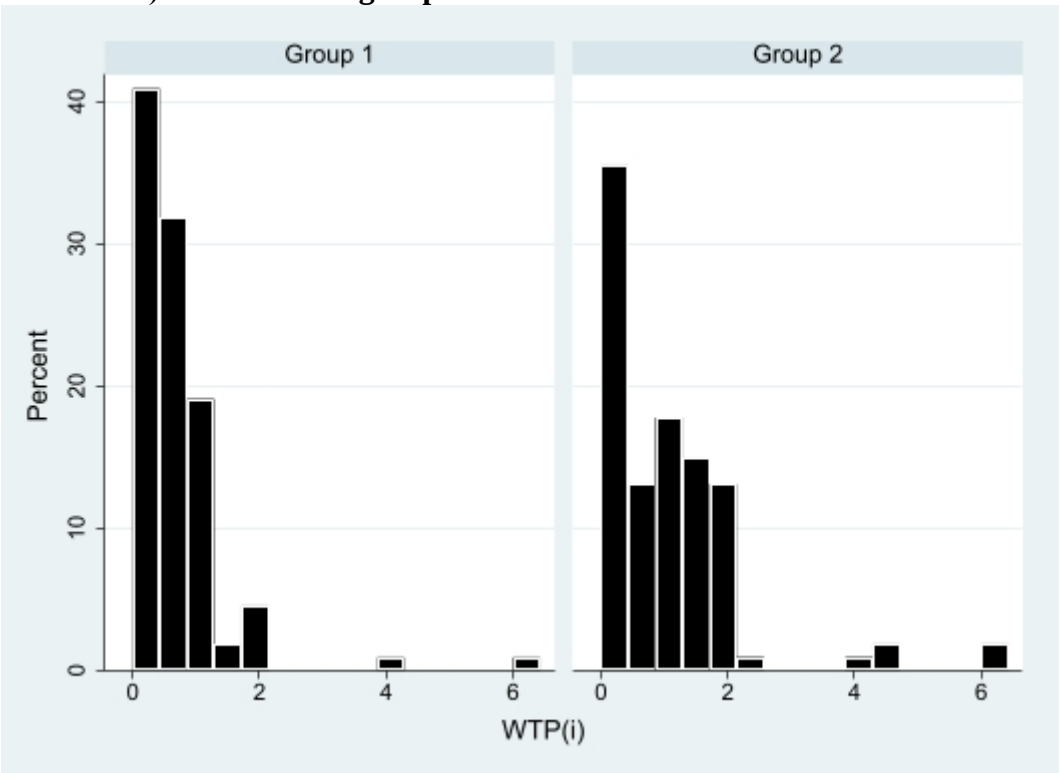
WHAT IS A DIGESTIVE BLEED?

The organs of the digestive system, such as the esophagus and stomach, are lined on the inside by a highly sensitive tissue known as mucosa. This digestive mucosa can sustain damage due to inflammatory processes, as seen in conditions like esophagitis and gastritis, or it may result from chronic lesions such as ulcers. Similar to the way external wounds can cause bleeding, injuries to the digestive system can also lead to blood loss, a condition known as hemorrhage.

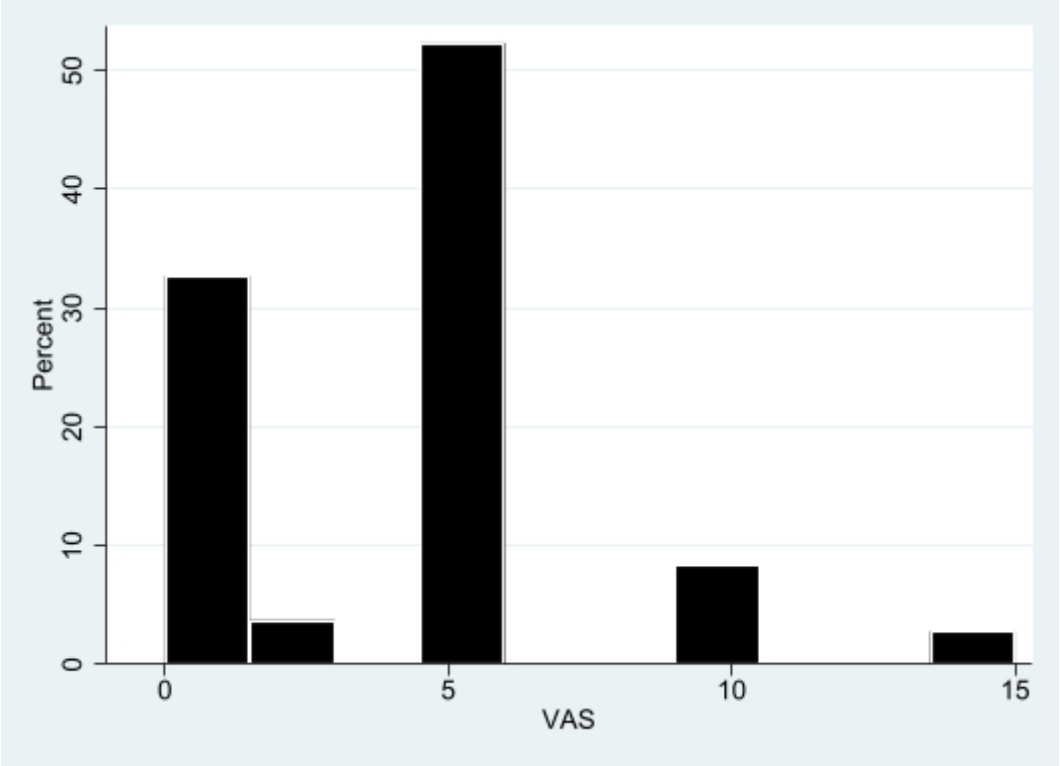


Gastrointestinal bleeding can be microscopic (only detected in the laboratory) or even massive, in which almost pure blood is expelled.
A small, prolonged bleeding can lead to anemia.
An acute massive hemorrhage can lead to shock due to lack of blood and even death in those who experience it. This occurs in approximately one out of every 10 cases.

Graph A1. Histograms of the Willingness to pay (WTP) for the information (i.e. the 'brochure') in each of the groups.



Graph A2. Histogram of the VAS responses in Group 2: percentages of the WTP for the drug that is attributable to the information contained in the 'brochure'.



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Tables and figures

Figure 1. The "traditional" leaflet

Indications

This medication is indicated for the treatment of ischemic heart disease, specifically coronary artery disease, due to its antiplatelet action. Its anticoagulant effect prevents the formation of thrombi in the arteries, thereby reducing the risk of experiencing a myocardial infarction.

Adverse Effects

Occasionally, individuals may experience gastrointestinal discomfort, including symptoms such as nausea, dyspepsia, and heartburn. Less frequently, adverse effects such as gastric ulcers, duodenal ulcers, and gastric hemorrhage may occur. Gastric discomfort may be more pronounced with higher doses and in patients with pre-existing ulcers or bleeding conditions. Gastric bleeding typically occurs without pain, potentially leading to anemia due to the occult blood loss in feces. The severity of this side effect is associated with the drug's dosage and patient-specific characteristics.

Figure 2. The complementary brochure

(additional information on side effects)

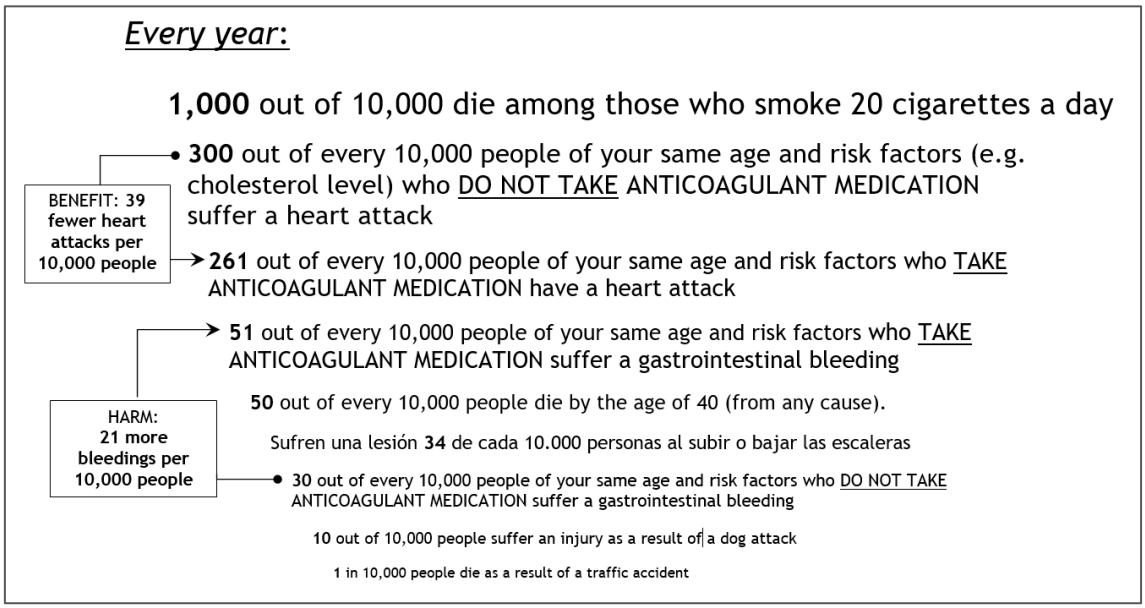
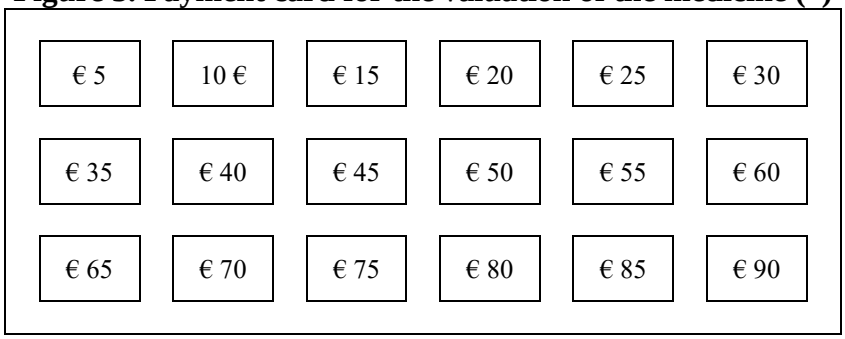


Figure 3. Payment card for the valuation of the medicine (*)



(*) To evaluate the medicine in the strict sense in sub-sample 1 and for the medicine and the additional information in Group 2.

Figure 4. Payment card for the valuation of the brochure (Group 1).

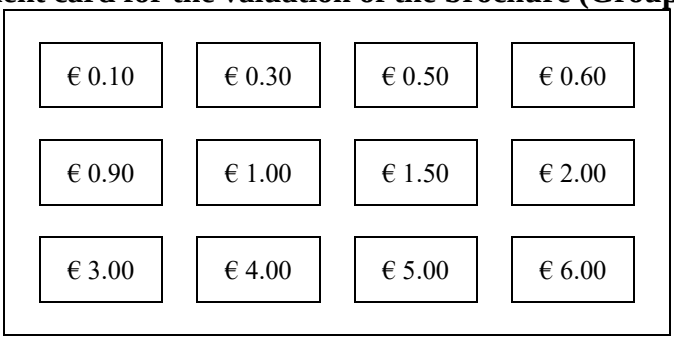


Table 1. Brief description of the regressors used

	Description
Sex	Dichotomous variable. Male (1); Female (0)
Married	Dichotomous variable. Married (1); Otherwise (0)
Primary studies	Dichotomous variable. Primary studies (1); Otherwise (0)
Secondary studies	Dichotomous variable. Secondary studies (1); Otherwise (0)
Higher education	Dichotomous variable. Higher studies (1); Otherwise (0)
Age	Continuous variable
Age^2	Variable *Age* squared
35<=Age<50	Dichotomous variable. 35<=Age<50 (1); Otherwise (0)
50<=Age<65	Dichotomous variable. 50<=Age<65 (1); Otherwise (0)
Age>=65	Dichotomous variable. Age>=65 (1); Otherwise (0)
Income	Continuous variable
Heart attack experience	Dichotomous variable. Has had experience (1), Otherwise (0)
Digestive bleeding experience	Dichotomous variable. Has had experience (1), Otherwise (0)
Numerical skills	Dichotomous variable. Mathematical skill (1), Otherwise (0)
Questionnaire Type 2	Dichotomous variable. Group 2 (1), Otherwise (0)

Table 2. Characteristics of the sample

	Group 1		***Group 2***		***Total***	
	n	***%***	***n***	***%***	***n***	***%***
Age						
less tan 35 years	38	34.5	36	33.6	74	34.1
35 to 49 years	38	34.5	36	33.6	74	34.1
50 to 65 years	22	20.0	22	20.6	44	20.3
65 and older	12	10.9	13	12.1	25	11.5
Mean Age (Std. Dev.)	41.07 (15.2)		42.33 (15,8)		41.69 (15.47)	
Sex						
Man	54	49.09	52	48.6	106	48.8
Woman	56	50.9	55	51.4	111	51.2
Married						
Yes	62	56.4	62	57.9	124	57.1
No	48	43.6	45	42.1	93	42.9
Level of studies						
No studies	10	9.1	6	5.6	16	7.4
Primary studies	30	27.3	36	33.6	66	30.4
Secondary studies	48	43.6	44	41.1	92	42.4
Higher education	22	20.0	21	19.6	43	19.8
Monthly income						
Between 600 and 1200 euros	35	31.8	37	34.6	72	33.2
Between 1200 and 1800 euros	22	20.0	23	21.5	45	20.7
Between 1800 and 2,700 euros	39	35.5	40	37.4	79	36.4
More than 2700 euros	10	9.1	11	10.3	21	9.7
Mean Income (Std. Dev.)	1689.8 (716.52)		1748.90 (691.8)		1719.12 (704.44)	
Numerical skills						
Competent	35	31.8	42	39.3	77	35.48
No competent	75	68.2	65	60.7	140	64.52
Heart attack experience						
Yes	5	4.55	3	2.80	8	4.15
No	105	95.5	104	97.20	209	95.85
Digestive bleeding experience						
Yes	8	7.27	13	12.15	21	9.68
No	101	91.82	94	87.55	196	90.32
TOTALS	**110**		**107**		**217**	**100.0**

Table 3. Willingness to pay for the complementary brochure (€)

	Group 1	Group 2	
	WTP(i)[1]	WTP(i)[2]	WTP(i)[2] (>0)
Mean	0.63	1.01	1.5
Median	0.50	1.00	1.375
Std Dev	0.766	1.156	1.115
Min.	0.1	0	0.25
Max.	6	6	6
N	110	107	72

WTP(i)[1]: WTP directly stated in euros. WTP(i)[2]: WTP converted to euros. Last column: participants in Group 2 with WTP(i)>0.

Table 4. Results of the regressions of the WTP for the brochure, WTP(i)

	OLS estimations			Tobit Model
	(1)	(2)	(3)	
Sex	-0.210	-0.197	-0.101	-0.236
	(0.142)	(0.135)	(0.139)	(0.154)
Married	-0.245	-0.252	-0.142	-0.218
	(0.167)	(0.165)	(0.165)	(0.190)
Age	0.0586**	0.0586**	0.0875***	0.0574**
	(0.0237)	(0.0235)	(0.0216)	(0.0266)
Age2	-0.0008***	-0.0008***	-0.0011***	-0.00083***
	(0.00025)	(0.00025)	(0.00023)	(0.00029)
Heart attack experience	0.283	0.242	0.227	0.399
	(0.325)	(0.321)	(0.330)	(0.362)
Digestive bleeding experience	-0.0564	-0.0415	-0.0675	-0.0847
	(0.225)	(0.223)	(0.228)	(0.261)
Numerical skills	-0.0886	-0.142	-0.0645	-0.172
	(0.162)	(0.153)	(0.164)	(0.172)
Questionnaire Type 2	0.389**	0.377**	0.467***	0.166*
	(0.161)	(0.152)	(0.161)	(0.71)
Income	0.00035***	0.00031**		0.00038***
	(0.00013)	(0.00012)		(0.00014)
Primary studies	-0.223		-0.133	
	(0.285)		(0.288)	
Secondary studies	-0.154		0.0293	
	(0.341)		(0.340)	
Higher education	-0.380		-0.0923	
	(0.366)		(0.356)	
35<=Age<50				
50<=Age>65				
Age>=65				
Constant	-0.368	-0.511	-0.720	-0.487
	(0.526)	(0.438)	(0.518)	(0.493)
Observations	216	216	216	216
R-squared	0.204	0.196	0.175	

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 5. Willingness to pay for the medicine (€)

	Group 1		Group 2
	WTP(m)[1]	WTP(m)[1]+ WTP(i)[1]	WTP(m/i)[2]
Mean	24.0	24.63	24.21
Median	20.0	21	25.0
Std Dev	15.322	15.523	10.797
Min.	5.0	5.1	0
Max.	90.0	90.5	50.0

WTP(m)[1]: WTP for the drug. WTP(i)[1]: WTP for the brochure (in euros).
WTP(m/i)[2]: WTP for the whole package including complementary brochure.

Table 6. Results of the OLS regressions of the WTP for the medicine, WTP(m)

	(1)	(2)	(3)	(4)
Sex	0.723	0.428	1.724	0.202
	(1.814)	(1.721)	(1.755)	(1.815)
Married	-4.719**	-4.819**	-3.769*	-4.532**
	(2.131)	(2.102)	(2.092)	(2.264)
Age	1.672***	1.677***	1.938***	
	(0.302)	(0.299)	(0.273)	
Age2	-0.0200***	-0.0199***	-0.0227***	
	(0.0032)	(0.0032)	(0.00295)	
Heart attack experience	1.800	2.181	1.289	2.435
	(4.153)	(4.082)	(4.174)	(4.288)
Digestive bleeding experience	2.819	2.658	2.717	2.530
	(2.870)	(2.841)	(2.890)	(2.982)
Numerical skills	-2.681	-2.570	-2.459	-2.365
	(2.064)	(1.944)	(2.075)	(2.032)
Questionnaire Type 2	-1.304	-1.594	-0.585	-3.904*
	(2.053)	(1.935)	(2.035)	(2.047)
Income	0.00321**	0.00336**		0.00533***
	(0.0016)	(0.0015)		(0.0015)
Primary studies	-1.257		-0.434	
	(3.640)		(3.642)	
Secondary studies	-1.813		-0.127	
	(4.356)		(4.303)	
Higher education	-0.189		2.459	
	(4.668)		(4.505)	
35<=Age<50				7.634***
				(2.528)
50<=Age>65				0.611
				(2.942)
Age>=65				-5.309*
				(3.127)
Constant	-7.045	-8.571	-10.28	18.00***
	(6.718)	(5.573)	(6.563)	(2.522)
Observations	216	216	216	216
R-squared	0.286	0.284	0.272	0.214

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 7. *Test-retest reliability* (correlations)

	Pearson	*Spearman*
Group 1		
WTP for the drug: WTP (m)[1]	0.8630	0.7719
WTP for the information: WTP (i)[1]	0.7219	0.8026
Group 2		
WTP for the drug (inc. Patient information leaflet): WTP (m / if)[2]	0.3375	0.1389
Percentage attributed to information: % WTP (i) [2]	0.3563	0.4679