The impact of information on patient preferences in different delivery patterns (prescription versus OTC drugs)

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Abstract

Recent literature in health care economics has shown increasing interest in the use of contingent valuation for measuring willingness to pay (WTP) as the economic value of health benefits. The impact of the provision of different levels and types of information on the results of contingent valuation studies has been examined in empirical work and discussed in the literature**.** However, the impact of the level of information on WTP may depend upon the delivery mechanism. This has not been assessed yet. We propose to study this effect while assessing patient preferences concerning a new class of drugs in the field of influenza disease. New anti-influenza drugs entered the market quite recently allowing influenza symptom alleviation for 1.5 days. These neuraminidase inhibitor drugs are currently prescription drugs but are not covered by health insurers. These drugs could well be imagined to be available over the counter (OTC) due to their small range of benign side effects and their ease of use. Our analysis aims at assessing the impact of information on patients' preferences in different delivery patterns (prescription versus OTC systems).

A randomized multicenter trial was performed to elicit preferences. The survey was designed to be paper self-administered. 1594 people were included. People were randomly assigned into receiving either limited or extended information. In each 'information arm', people had to answer the WTP questions to two scenarios. The first scenario asked the WTP for an out of pocket expense for the new prescription drug. The second scenario asked the WTP for the drug if it were an over the counter drug.

As far as the analysis was concerned, we were faced with two main difficulties. First, answers laid in intervals (and were not point estimates). Second, each respondent answered the valuation question for both scenarios, which might result in answers being correlated for a given individual. Both issues were handled through the implementation of a random-effects interval censored regression.

Our results show that the level of information plays a significant role for the prescription free medicine, with an extended level of information pushing the WTP to upper levels. To the contrary, the level of information has no impact on the WTP for the prescription medicine. This suggests that, when visiting a doctor, patients tend to rely on the doctor's knowledge. In contrast, patient decision making (as expressed by OTC choice) requires the provision of relevant information.

1. Background and Objectives

1.1. Background

Recent literature in health care economics has shown increasing interest in the use of contingent valuation (CV) for measuring willingness to pay (WTP) as the economic value of health benefits (Johansson, 1995; Olsen and Smith, 2001). Based on a survey approach, the CV method consists in confronting respondents with an hypothetical market in order to elicit their maximum willingness-to-pay (WTP) for buying a new good or service (Carson, 2000). A major challenge raised by the use of CV is related to the fact that individuals may be influenced by the level of information that is provided to them through the survey procedure (Tversky & Kahneman, 1981).

The impact of the provision of different levels of information on the results of CV studies has been examined in empirical work both in the environment (Bergstrom, Dillman & Stoll, 1985; Hanley & Munro, 1999; Whitehead & Blomquist, 1991) and health literatures (Berwick & Weinstein, 1985 ; Donaldson & Schakley, 1997 ; Lee et al., 1998; Domenighetti, 1999 ; Protiere et al., 2004). It is confirmed that respondents's WTP may be dramatically influenced by the level of information provided in the hypothetical scenarios and that this impact may vary among individuals. However, existing studies emphasize inconsistent effects of additional information on WTP values. An individual may revise his WTP downward (Donaldson and Schakley, 1997; Domenighetti, 1999) as well as the opposite (Protiere et al., 2004) when some comprehensive information is provided. Note that additional information mostly refers to health attributes (risks of complications, length of treatment procedures, risks and benefits of possible alternatives) of the programmes under study.

Knowing that non health attributes such as the aspects of health care delivery may affect how the goods are valued (Gerard and Mooney, 1993; Olsen and Smith, 2001), the impact of the level of information on WTP may depend upon the delivery mechanism. This has not been assessed yet.

1.2. Objectives and Rationale

Our analysis aims at assessing the impact of information on patients' preferences in different delivery patterns, namely prescription versus over the counter (OTC) systems. Indeed, when visiting a doctor, the patient may mostly rely on the doctor's knowledge. Opting for an OTC medicine requires full individual choice and self-administration. Consequently, some additional information concerning the effects or the constraints associated with the medication would be expected to have a more decisive impact on the valuation of the product in the OTC than in the prescription scenario. Our goal is to assess whether the level of information will have a differential impact on the WTP in the prescription and OTC systems and whether this impact is positive or negative.

The paper is structured as follows. Section 2 presents the data. The econometric specification is detailed in section 3 before the results are shown in section 4. The last section discusses our findings.

2. Data

We propose to study the informational effect within a study comparing patient preferences concerning a new class of drugs in the field of influenza disease between different delivery patterns. In most western countries, neuraminidase inhibitors (NAIs) entered the market at the beginning of the decade, allowing influenza symptom alleviation for 1.5 days provided that they should be taken within 48 hours after onset of symptoms. Note that recent studies (not available at the time when the study was initiated) show that early administration increases the benefit of anti-influenza drugs (Aoki et al., 2003; Kwai et al., 2005). NAIs are currently prescription drugs but are not covered by health insurers. Due to their small range of benign side effects and their ease of use, they could well be imagined to be available OTC. The threat of a bird flue epidemic is even making the debate over the delivery form more acute.

1594 people participated in the randomized multicenter WTP study which took place in the French speaking part of Switzerland during the winter 2000/2001 and the summer 2001.

2.1. Questionnaires

Questionnaires were designed to be self-administered. All respondents were first provided with some information on influenza and its health risks, as it was considered that all respondents should have a comparable level of understanding of the disease. Then all respondents were made aware of the availability of a new class of antiviral drug which would be able to reduce the duration of the flue by 1.5 days if taken within 48 hours after onset of symptoms. All respondents were finally asked to answer two WTP questions framed into 2 scenarios. The first scenario asked the WTP for this new drug if it were sold as a prescription medicine. It was reminded that the purchase would represent an out-of-pocket expenditure (not reimbursed) and that the consultation would also need to be paid for. The second scenario elicited the WTP for the same new drug if it were purchasable as an OTC drug. It was explained that this drug could be bought without restriction in the pharmacy.

A payment card system was used to facilitate answers. Note that this method is a valid (Donaldson, Thomas and Torgerson, 1997) alternative to dichotomous choice questions. The proposed bidding ranges (expressed in Swiss Francs) were: nothing, 1 – 20, 21 – 40, 41 – 60, 61 – 80, 81 – 100, 101 – 150, 151 – 250, 251 – 500, 501 – 1000, more than 1000. In order to exclude starting point biases, the order of the bidding ranges were offered in a top down and bottom up fashion. Increasing and decreasing bidding ranges were randomly allocated.

2.2. Testing for the informational effect

In order to assess the effect of a variation in the level of information provided, participants were randomly assigned into receiving either basic or basic plus extended information concerning NAIs. Basic information was provided to all respondents and referred to the scope of the medication (ability to lower influenza symptoms by 1.5 days if taken within 48 after release of symptoms) and its mild side effect. In addition to this, those receiving extended information were explicitly made aware of the drug not being able to prevent or cure the flue and not being active against common cold. It was stressed that this drug did not replace vaccination. Storage recommendations (one year shelf life) were also highlighted.

Furthermore, note that both health professionals and lay people were enrolled in the study sample in order to control for potential knowledge bias. Lay people included healthy adults

from the hospital's administration, military enrollees as well as patients treated at the outpatient clinics of the University hospital of Lausanne.

2.3. Additional questions

Furthermore, demographic data (gender, age, family status, country of origin), education and employment status were collected for each respondent. Self-assessed health status and previous influenza vaccination were also investigated as well as insurance choices. Note that the questionnaire was developed by the last author and underwent a validation process.

3. Econometric specification

The econometric model aims at identifying the varying impact of information on WTP in different delivery patterns while controlling for the impact of other covariates.

3.1. Assumptions

In line with Cameron and James (1986, 1987), we assume that no one needs compensation or in other words that negative WTP values are not possible. This assumption is relevant when there is no need to use the good if one does not want to, as is the case when a new good is introduced on the market (our case). Note that in development versus preservation trade offs (for example: build a new public hospital versus leave the area a park) some people gain while others lose from the proposal. In such situations, negative WTP are possible; the informational content of an agent who does not favor the plan is that the agent's WTP lies in the interval minus infinity to 0.

In our study, we assume that zero answers can be considered as very small WTP. When the patient ticks the "nothing" box, it is inferred that the respondents's true value lies in the interval]0,1]. We assume that any type of strategic behavior pushes such answers toward zero.

3.2. Model specification

As far as the econometric specification is concerned, we are faced with two main difficulties. First, answers lie in intervals (and are not point estimates). Second, each respondent answers the valuation question for both scenarios, which might result in answers being correlated for a given individual. In other words the answers to the OTC scenario question may be affected by the answers on the prescription scenario question. Even if it is the same drug, the indicated WTP (interval) on the prescription question is a kind of starting point for the process of locating WTP (interval) for the OTC case.

The first issue will be handled through the implementation of an interval censored regression over the full range of responses. Indeed, assuming that "zeros" are probably very small positive WTP, the questionnaire provides upper and lower bounds on WTP except for the last interval which is right censored. Since valuation ought to be positive, and since the distribution of valuations has been shown to be frequently skewed (Cameron and James, 1986 and 1987), we propose to use a lognormal conditional distribution for valuations (Cameron and Huppert, 1989). The respondent's true valuation Y_i^* is known to lie within the interval defined by lower and upper thresholds t_a and t_b. It implies that (log Y_i^*) will lie between (log t_a) and (log t_b). Assuming that E(log $Y_i^* \backslash x_i$) is some function $g(x_i, \beta)$, for which a linear form is computationally convenient, we will have $(\log Y_i^*) = x_i^{'}\beta + u_i$, where u_i is distributed normally with mean 0 and standard deviation σ.

Then it comes:

$$P\left(Y_i^* \in (t_{ai}, t_{bi})\right) = \Pr\left(\frac{\left(\log t_{ai} - x_i^{'}\beta\right)}{\sigma} < z_i < \frac{\left(\log t_{bi} - x_i^{'}\beta\right)}{\sigma}\right) = \Phi(z_{bi}) - \Phi(z_{ai})$$

where z_i is the standard normal random variable, $z_{ai} = \frac{\log t_{ai} - x_i^{'}\beta}{\sigma}$, $z_{bi} = \frac{\log t_{bi} - x_i^{'}\beta}{\sigma}$ and Φ is the cumulative standard normal density function. The log-likelihood function can be written as:

$$\log L = \sum \log[\Phi(z_{bi})] + \sum \log[\Phi(z_{bi}) - \Phi(z_{ai})] + \sum \log[1 - \Phi(z_{ai})]$$

with the first sum over left-censored observations, the second sum over interval-censored observations, the third sum over right-censored observations. A maximum likelihood estimation can then be performed.

Note that we could also have thought of fitting an ordered probit model instead of an interval-censored regression. However the ordered probit model is not the correct model here as we know the "cut-off points" for the intervals and those cut-off points are in the monetary metric that we want (Cameron, 1988).

In order to deal with the second challenge (ie correlations between answers for a given respondent), we extend the Cameron and Huppert's approach (1989) to a random effects interval data regression model , thus modeling individual's heterogeneity explicitly and taking into account some individual consistency across observations.

3.3. Econometric Implementation

Finally, the econometric model to be fit is the following:

$$\log Y_{is}^{*} = S\alpha + (S_0 * I_i)\gamma_1 + (S_1 * I_i)\gamma_2 + X_{is}\beta + u_i + v_{is}$$

i denotes the individual, *S* the scenario (either prescription or OTC) and *I* the information level (either basic or extended).

Y_{is}^{*} is the respondent's true valuation which is known to lie within the interval defined by lower and upper thresholds.

u_i and v_{is} are error components normally distributed with zero means and independent of one another. u_i is the individual specific random effect.

(S_0 * I) and (S_1 * I) are the interaction terms between the scenario and the information level and will capture the impact of information respectively in the prescription and OTC delivery system.

X_{is} includes socio-demographic and health-related covariates.

The selection of covariates includes testing whether covariates have a different impact on WTP for the prescription and the OTC drugs. Let us note (X_1, X_2, …., X_j) the set of socio-

demographic and health-related covariates. *n* observations are available in each scenario. S_0 denotes the column vector made of 2*n* elements ("1" when the observation is related to the prescription scenario and "0" when the observation is related to the OTC scenario) and S_1 the column vector made of 2*n* elements ("0" when the observation is related to the prescription scenario and "1" when the observation is related to the OTC scenario).

We estimate the following model:

$$Y_{is}^{*} = \alpha S + \gamma_1(S_0 * I_i) + \gamma_2(S_1 * I_i) + \beta_1 X_1 S_0 + ... + \beta_n X_n S_0 + \delta_1 X_1 S_1 + ... + \delta_n X_n S_1 + u_i + v_{is}$$

The following equality tests are then performed:

$\beta_1 = \delta_1$
$\beta_2 = \delta_2$ ….
$\beta_j = \delta_j$

4. Results

4.1. Descriptive statistics

1594 subjects were enrolled in the trial. Their characteristics are summarized in Table 1. We obtained responses from 890 females (59.1%). 74% of the participants regarded their health status as perfect. Half of the population had complementary health insurance. 39% had been vaccinated in the year of the study or during the previous year. 66.5% of the participants were healthcare professionals (22% of them were physicians, who will also be referred to as senior or highly qualified health care professionals). As expected by the use of a randomized procedure, there was no significant difference between the characteristics of the subgroups who were provided with different levels of information.

The payment card interval choice frequencies appear in Figure 1. An unexpected peak was observed for the interval 81 – 100 (especially for the prescription scenario). This may be attributable to the fact that this interval lies right in the middle of the scale whether it is descending or ascending. Another explanation is that the drug price in Switzerland was 80 Francs, which some people might have been aware of. Figure 2 suggests that people receiving extended information tend to be more willing to pay for the drug. However this tendancy is significant (at a 10% level) in the OTC scenario only. Figure 3 shows that individuals being assigned to basic information are less likely to be willing to pay both for a prescription and an OTC drug

4.2. Econometric estimations

Equality tests described above show that all covariates except for the highly qualified professional knowledge, and the answer bid structure play a similar role on WTP independently of the delivery mechanism.

The final random effects interval censored regression is to be found in Table 2.

The level of information plays a significant role for the prescription free medicine, with an extended level of information pushing the WTP to upper levels. To the contrary, the level of information has no impact on the WTP for the prescription medicine. This result is highly interesting. When the patient asks for medical advice, she entirely relies on the doctor's knowledge. However, when opting for an OTC medicine, the patient feels responsible for her health and requires relevant information to make an informed choice.

The results also show that the WTP is significantly higher when the drug is delivered over the counter (vs through the doctor's prescription).

As far as the other covariates are concerned, a couple of results were to be expected. In particular, the higher the influenza threat (winter time) is, the bigger the WTP is. People having an acute awareness of the influenza risk or being risk averse (as expressed by being vaccinated) express higher WTP for the drug. Furthermore, people with higher incomes (if we assume that the level of education is a proxy for the income class) are willing to pay more for the drug ex ceteris paribus. However, other results are more surprising. Health care professionals do not grant to the prescription drug as much value as non professional people do; they may not regard the product as a genuine medical product requiring the physiscian's intervention. However, highly qualified health care professionals value the OTC drug as much as non professionals do, thus suggesting that the OTC version of the drug holds a different status and has a value per se. Though we might have expected the elderly to be more interested in getting the drug, our data also suggest that younger people tend to favor the drug much, suggesting that the type of drug considered might fulfil expectations shared by young people. The type of insurance coverage does not play any role. Neither is the health status associated with a higher WTP. As a result many features tend to suggest that the studied drug is not seen as a traditional treatment but rather as a comfort accessory, which is confirmed by the fact that it is preferred in an OTC release form.

5. Discussion

One issue that could have arisen with the two release forms was an implicit assumption that the prescription form of the drug had to be stronger/ better than the over the counter pharmacy version. A prescription drug might be regarded as more powerful. Furthermore, prescription means that the patient will meet a doctor. Although time consuming this might provide the patient with an opportunity to get targetted recommendations for use of drugs; the patient is perhaps more likely to get the correct diagnosis than if he/she makes the diagnosis on her own (as in the prescription free scenario). This bias seems not have occurred here. Furthermore, the prescription form of the drug could have benefitted from a sequence effect which states that WTP is expected to be much larger for the first good of a series of goods (Payne et al., 2000). If such an effect is present here, it is much counterbalanced by a better evaluation of the OTC good.

To the contrary, we must discuss the possibility that some people might have thought that the OTC drug had to be sold at a higher price for some reason. In particular we may wonder whether our results might have been driven by any misunderstanding about the seriousness of the disease or an implicit assumption that the OTC form should be sold at a higher price because it enables to save on the doctor's visit. Firstly, as explained, all respondents were made aware of the medical risk of influenza; therefore we can exclude that the general population may have under-estimated the seriousness of the disease and favoured a self-administered medication for this reason. Secondly, we found that that senior health professionals value the OTC delivery of the drug (and not the prescription one) as much as the general population does. This result can be interpreted in the following manner. It costs time and perhaps money for the general population to see a physician in order to get a prescription. If the drug is sold OTC, this cost can be avoided; hence, it may not be surprising that on average people would be willing to pay more for the drug if it was sold OTC. Physicians, however, do not face the same issues as time or money to get a prescription, so one might have expected them to be indifferent to the choice between prescription or OTC. However this was not the case and we conclude that the OTC delivery option is indeed preferred and that this result was not simply the result of some people thinking that the OTC product should be sold at a higher price for some reason. We may conclude that the clear reduction of constraints represented by the OTC delivery mechanism is preferred as a desire of self responsibility for the kind of drugs studied here.

We also checked whether some “nothing “answers could be attributable to protest zeros (Mitchell & Carson, 1989). For this purpose, we run a bivariate probit model on the propensities to pay for respectively a prescription and an OTC medicine. This approach allowed us to identify patient characteristics associated with null answers, thus making it possible to infer whether some respondents may not be feel concerned or express aversion to contributing to a publicly funded health care system. In addition a probit model was estimated on the subgroup of those who answered “zero” to both scenario 0 and scenario 1 (Table 3). It shows that the probability of declaring zero WTP to both scenarios rises when the questionnaire is filled in during summer time, when respondents are older, have a lower educational level, when they work as health care professionals, when they have not suffered from influenza over the past two years. When the influenza threat is regarded as low (during summer time or because the last influenza event is wiped out of memory), it is not surprising that people should value the drug less. If the education level may be considered as a proxy for income, our results also make sense. Professional knowledge plays a particular role, suggesting that health care professionals may not favor the drug. Whatever the reason might be, health care professionals can not be considered as protesters. As is the case for older people who are encouraged to protect themselves against influenza but seem not to have much confidence in the new class of drugs. These results clearly suggest that people declaring zero values to both scenarios cannot be regarded as protesters. The bivariate probit model (results not shown) provides consistent results as far as factors associated with being willing to pay for a positive amount of money to get the drug are concerned. Furthermore, the bivariate probit model confirms that the willingness to pay a positive amount of money for an OTC drug may increase if the information level is high (whereas the information level has no impact on the WTP for the prescription drug).

As far as the design is concerned, we may think that it could have been worth randomizing the scenario order. However a new (and perhaps worse) bias might have occurred: if the patient were offered an OTC drug first, he/she might infer that the questionnaire might provide her/him with information. As a prescription drug is a common answer to a medical problem, it may be less confusing for the respondent to be offered the prescription scenario first. However, this issue would deserve some further attention. Another methodology limitation of our study is related to the data collection**.** The education level gives indirect hints to salary but no direct income variable is available.

We might also discuss the estimation methodology that was applied in this article. We specified a parametric distribution for the distribution of WTP and a lognormal distribution was used. We found it necessary to performation estimations with a Weibull distribution, which seems to be quite often used (An, 2000). However, our results are not qualitatively different under a Weibull distribution. Furthermore, in line with An (2000), we also tested our parametric assumption on the link function against a semi-parametric proportional hazard specification using a likelihood ratio test. We could not reject the parametric model specification.

6. Conclusions: patients and informed decision making

We show that the level of information plays a significant role for the prescription free medicine, with an extended level of information pushing the WTP to upper levels. To the contrary, the level of information has no impact on the WTP for the prescription medicine. This result provides some light on the much debated issue of patient decision making.

Over the past few years, patient autonomy has been largely promoted through the increase of screening practices, the implementation of preventive medicine or even the introduction of health plan choices in some countries. In our study, enhanced patient decision making is embodied by the availability of OTC drugs. Our results confirm that the requirement for patient decision making is the provision of relevant information allowing the patient to decide whether to access a treatment or not. We provide some evidence that informed choices may drive to options more likely to fit patients'values and preferences. This calls for the central responsibility both of institutions and doctors in providing the public and individuals with relevant evidence-based information. At a moment in history when elderly Americans are facing large numbers of choices in health plans that will insure prescription drug risks these results may offer some cautions regarding the needs for decision supports.

Furthermore, our results suggest that it is essential to enable a more active consumer role in clinical decision making among those who are more prone to rely completely on the opinion of their doctors. Some welfare gain could be found if he patient got more involved in clinical decision making. This could be achieved by encouraging the public to ask physicians

questions and by encouraging the physician to deliver a minimum set of evidence-based information each patient.

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Table 1: Description of the population

		Information level		
	N = 1594	Basic	Extended	P*
Females (%)	**55.8%**	55.9%	55.8%	0.7
Age (mean, std)	**35.4 ±12.1**	35.5	35.4	0.7
Mandatory school (%)	**6.4%**	6.5%	6.3%	0.4
High school (%)	**10.8%**	11.5%	10.1%	
Skilled training (%)	**49.7%**	50.0%	49.5%	
University (%)	**33.0%**	32.0%	34.1%	
Working (%)	**90.3%**	90.1%	90.4%	0.6
Senior Health care professional (%)	**14.6%**	13.1%	16.0%	
Non senior Health care professional (%)	**52.0%**	53.5%	50.6%	0.1
Supplementary insurance (%)	**49.4%**	48.4%	51.4%	0.4
Perfect subjective health status (%)	**74.0%**	74.4%	73.8%	0.8
Vaccinated against flue (%)	**29.9%**	29.9%	29.6%	0.9
Administered in winter time (	**56.2%**	55.9%	56.4%	0.8
Basic information level (%)	**49.5%**			

*basic vs extended (Khi 2 test)

Figure 1: Interval choice frequencies for precription and OTC scenarios, by information level

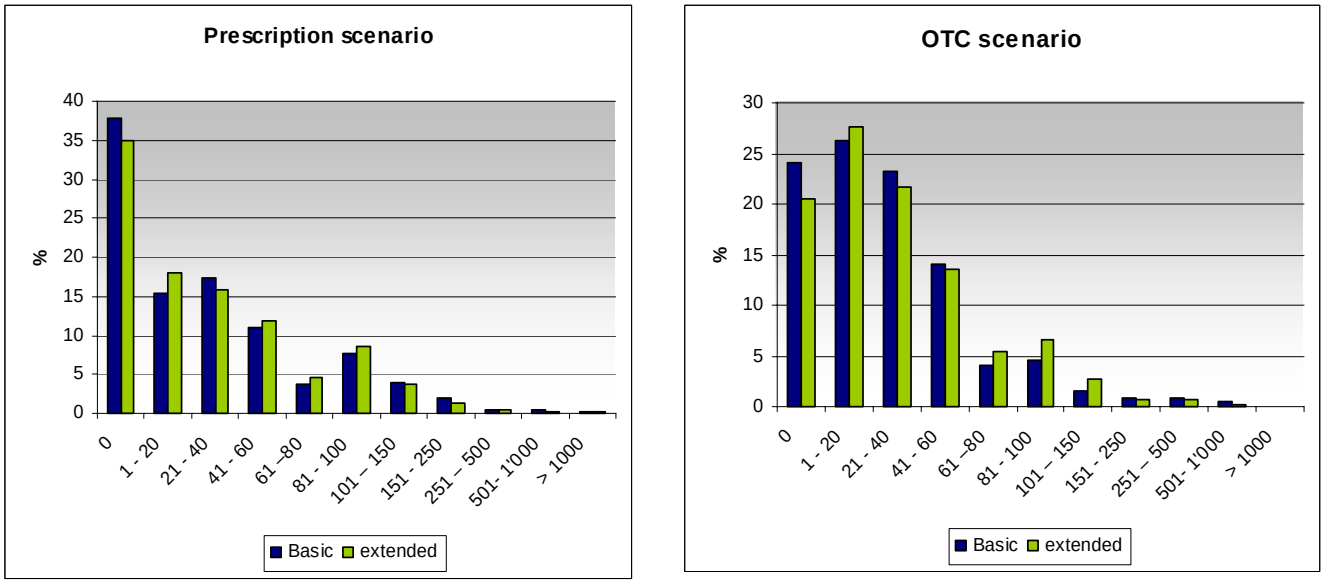

Figure 2: Interval choice frequencies (“nothing” vers positive answers) for precription and OTC scenarios, by information level

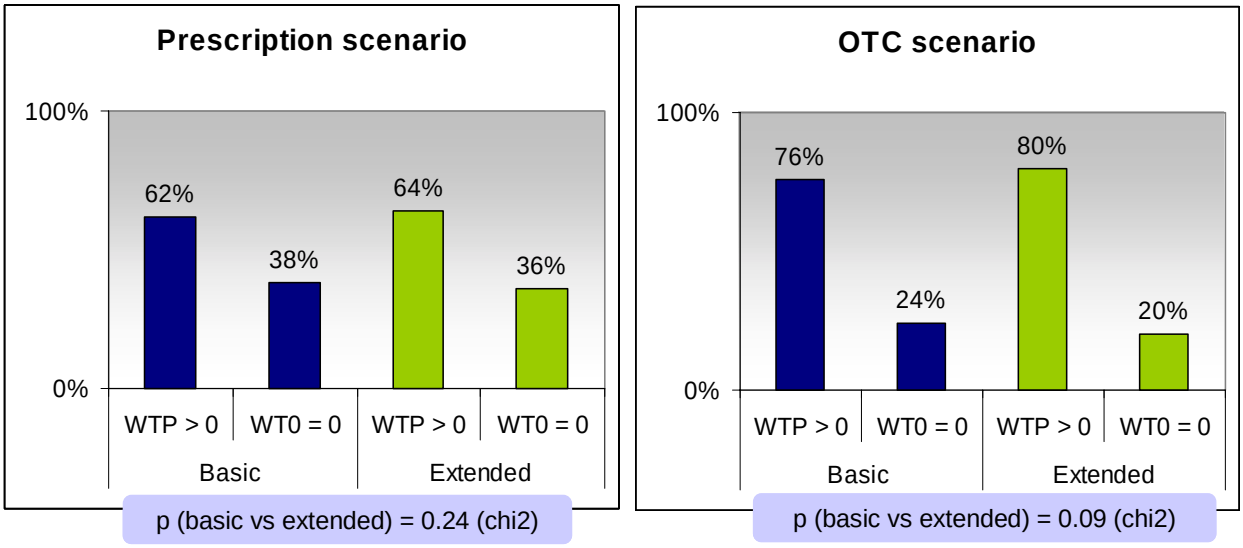

Figure 3: Combination of zero and positive answers to the prescription and OTC scenarios, by information arm

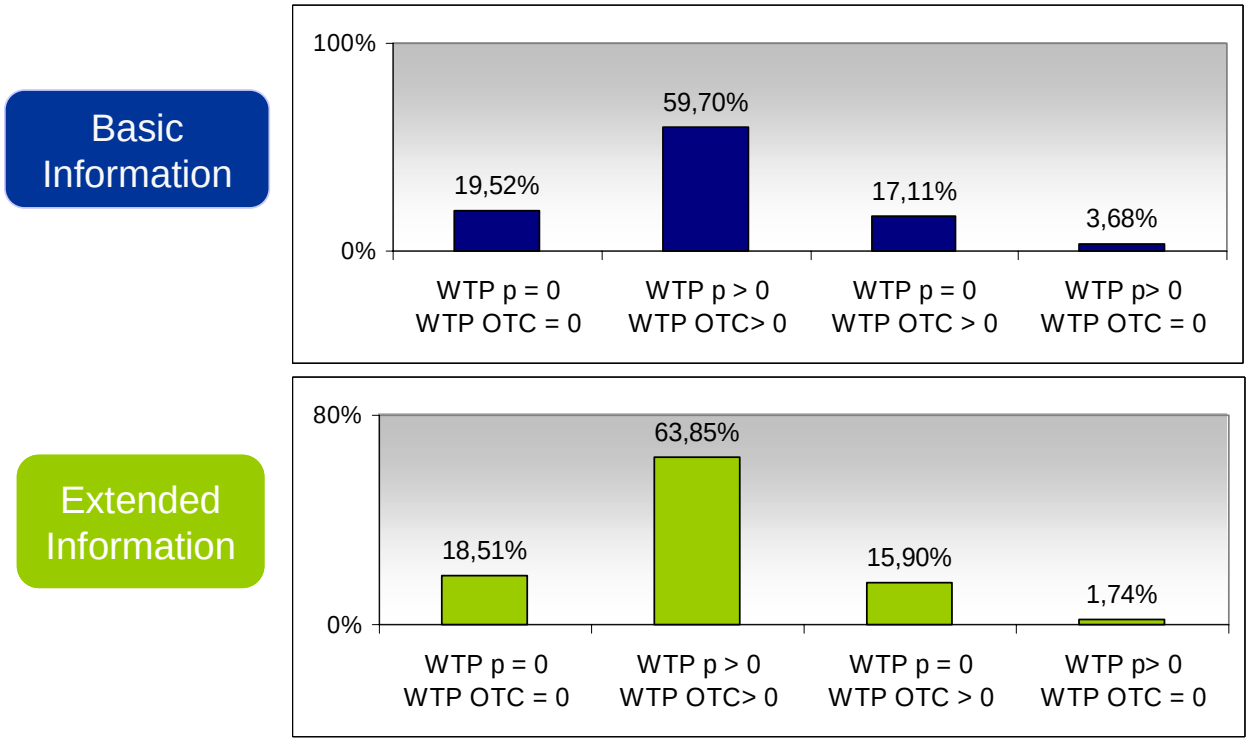

Table 2: Panel interval regression estimations over the full range of responses

	Coef	p
OTC scenario	.26	0.02
Limited information in the prescription scenario	-.12	0.36
Limited information in the OTC scenario	-.22	0.06
Ascending ranges in the prescription scenario	-.16	0.22
Ascending ranges in the OTC scenario	.03	0.79
Questionnaire filled in during winter time	.37	0.008
Male gender	.05	0.73
Age (<24, (25,64), >65)	-.43	0.009
High school*	.88	0.005
Skilled training*	.73	0.005
University*	.96	0.001
respondent having a job	.27	0.243
Senior health care professional in the OTC scenario**	-.32	0.16
Non Senior health care professional in the OTC scenario**	-0.70	<0.01
Senior health care professional ** in the prescription scenario**	-.67	0.004
Non senior health care professional in the prescription scenario**	-.70	<0.01
Basis + supplementary insurance	-.02	0.84
Subjective health status: prefect	-.15	0.30
Suffering from chronic disease	.23	0.35
Vaccinated against influenza	.58	<0.01
constant	1.79	<0.01
/sigma_u	2.02	<0.01
rho	0.72	

* mandatory schooling = reference , ** lay people = reference

Table 3: Probit model explaining zero answers to both scenarios

	Coef	**p**
Limited information	.073	0.344
Ascending ranges	-0.05	0.511
Questionnaire filled in during winter time	-0.18	0.035
Male gender	-0.01	0.885
Age (<24, (25,64), >65)	0.30	0.006
High school	-0.45	0.018
Skilled training	-0.43	0.005
University	-0.38	0.023
Health care professional	0.28	0.004
Basis + supplementary insurance	0.02	0.801
Subjective health status: perfect	0.06	0.490
Suffering from chronic disease	-0.08	0.625
Vaccinated against influenza	-0.22	0.019
Personal history of influenza over the past 2 yrs	-0.21	0.025
constant	-1.08	0.000

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