

# **Does Providing the Causes of Chronic Obstructive Pulmonary Disease Influence its Monetary Value Assessed by Contingent Valuation?**

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## **1 Introduction**

Called *Pretium Doloris* in legal language (Braudo, 2018), disutility in economics (Rozan, 2001) among other terms, the more commonly named “pain and suffering” is an effect of health impairment. Whereas other effects of a health impairment, such as the costs of the treatment or the loss of wages can be (quite) easily measured, pain and suffering cannot be directly assessed. Monetary valuation is one way to assess the value to make it possible to compile it with other consequences to help stakeholders decrease these impacts (Hunt and Ferguson, 2010).

Methods have been developed to figure this monetary value out. Among them, in contingent valuation, a stated preference method, affected population is asked their preferences by creating a fictitious market of the studied good, through a questionnaire. This questionnaire aims at capturing the actual preferences of the respondents and at avoiding biasing their answers through the questionnaire. One potential source of bias may be due to the level of information given to the respondents: no information may lead the respondents to imagine everything; too much information may lead to overload and misunderstanding.

The European project HEIMTSA (Maca et al., 2012; Maca et al., 2011) assessed the value of chronic obstructive pulmonary disease (COPD), an illness characterized by the irreversible deterioration of lungs function, mainly caused by active or passive smoking (Andreas et al., 2009) followed by air pollution (indoor, outdoor, occupational exposure). Whereas the results of this survey were used to support decision in air pollution context, and COPD is mainly caused by smoking, it did not precised any causes in the questionnaire.

A question appears: Does the monetary value of pain and suffering depends on the causes of the illness? Should these causes be indicated in the contingent valuation questionnaire?

After a brief review of the theory, this work present the results of a contingent valuation, which empirically trets the influence of providing the cause of the valued illness in the contingent valuation questionnaire.

## 2 Literature

Recommendations are almost consistently made (Ajzen et al., 1996; Boyle, 2003; Mitchell and Carson, 1989) to put for contingent valuations to be put in some context; with little precision other than: i) enough information for the respondents to be familiar with the good to value and consequently eliciting a meaningful value, and increasing the acceptability of the questionnaire; ii) little enough for not overwhelming the respondents, or influencing them. Whereas a no-context approach would tend to make respondents producing values resulting from under-informed decision, the contextualized approach risks facing the embedding effect, influencing respondents' WTP, and cannot avoid the information bias.

When focusing on the causes of an illness, Rozan and Willinger (1999) recall that regarding economic theory the amount stated should not be dependent of the cause. However, Rozan (2000) highlights the different approaches may lead to differences on the object valued: not giving information about the causes of the illness may value the illness itself whereas giving them may lead the value the environmental degradation which causes the illness.

Experimentally, various approaches have been followed. Navrud (2001) and Rozan (2001) have for example provided low information level on cofactors.

In the European survey NEEDS (Desaigues et al., 2011; Desaigues et al., 2006), full information were provided on the possible co-factors, here about the various impacts on health of air pollution and the elements influencing life expectancy. Ami et al. (2011) and Ami et al. (2013) proposed three ways to decrease the effects of the air pollution (moving, drugs, new regulation). They stated that respondents react differently to the various options, depending on the scenario and their personal characteristics.

Whatever the chosen approach (providing or not information on cofactors), debriefing questions about the causes of the valued health status may be added at the end of the questionnaire to understand which information the respondents took into account in the valuation.

The influence of providing information is not clear: in some cases an increase and in others a decrease of the stated value is observed when information on the context is given. Braathen et al. (2009) observed, in a meta-analysis on surveys valuing mortality, that giving no or low information in the questionnaire leads to lower WTP values than using questionnaire giving more information. Work on choice experiment, while not showing many differences in WTP when providing well-thought information, these information increase the reliability of the WTP (decreasing the confidence interval in the valuation).

The present contingent valuation will empirically test the influence of providing different causes of COPD to see the influence on the valuation.

### 3 Method

#### 3.1 Design of the questionnaire

After the review of the literature, a case study was conducted to test the influence in a contingent valuation of the context, more specifically the causes of the valued health impacts, on its value. The contingent valuation questionnaire is based on the one used in the project HEIMTSA (Maca et al., 2012; Maca et al., 2011), which provided no information about the causes or context of the illness.

The survey valued pain and suffering due to COPD, for its four stages, described in Figure 1: one day of cough, chronic bronchitis, COPDm, COPDs. The payment vehicle was a magic pill to immediately cure this illness. The payment was a monthly contribution over ten years, and a onetime payment for cough.

	Cough	COPDm	COPDs	Chronic bronchitis
	Maladie violette	Maladie marron	Maladie azur	Maladie jaune
Symptômes	Toux persistante avec crachats	- Essoufflement dès qu'une activité physique modérée est pratiquée, par exemple : marche rapide sur terrain plat ou en légère montée - Toux avec crachats presque chaque jour	- Essoufflement important, au point de ne pas pouvoir sortir - Toux importante - Sifflement lors de la respiration et poitrine compressée - Sensation de fatigue ou d'épuisement - Hospitalisation nécessaire dans certains cas	Toux forte avec crachats. Essoufflement pendant les périodes de toux
Fréquence	Plusieurs fois par jour	Presque chaque jour	Presque chaque jour	Chaque jour, au moins 3 mois par an
Durée	1 jour	Tout le reste de votre vie	Tout le reste de votre vie	2 ans ou plus
Conséquences	Qualité de vie normale	- Prise régulière de médicaments et rendez-vous réguliers chez le médecin - Impact significatif sur la qualité de vie, éventuellement impossibilité d'exercer certains emplois - Les activités quotidiennes restent possibles (faire les courses, cuisiner, faire le ménage, s'habiller)	- Très souvent, obligation de rester au domicile - Besoin d'aide pour les tâches quotidiennes (telles que s'habiller, faire sa toilette) - Régulièrement ou toujours besoin d'un appareil à oxygène pour respirer - Prise de médicaments plusieurs fois par jour - De temps à autre période d'aggravation des symptômes, nécessitant une hospitalisation	Difficulté à faire des efforts importants pendant les périodes de toux
Evolution	Retour à une santé normale	- De temps à autre période d'aggravation des symptômes, nécessitant plus de médicaments - Risque de complications	- Incapacité permanente nécessitant une surveillance médicale à vie - Mort prématurée presque inévitable	Possibilité que les symptômes durent plus de 2 ans

Figure 1: description of the illnesses

Four variations of the questionnaire were designed to test the influence of providing information on the two main causes of COPD:

- ✓ “Baseline questionnaire”, with no context: the respondent get no information about context and cofactors. It is similar to the one used in the HEIMTSA project.
- ✓ Variant 1, with full context, indicates the illnesses are usually caused by air pollution, but mainly by smoking.
- ✓ Variant 2 provides information that the illnesses are caused by air pollution.”
- ✓ Variant 3 provides information on the fact that the illnesses are usually caused by smoking.

It has to be noted that, as smoking is one cause of the studied illness, smoking habits of the respondents are specifically watched out. Figure 2 presents the structure of the questionnaire and highlights their differences.

Introduction	<ul style="list-style-type: none"> <li>•Context of the study</li> <li>•Aim of the study</li> <li>•General information (such as no good or bad answers, anonymity, and duration)</li> </ul>
Part 1: Health status	<ul style="list-style-type: none"> <li>•Health status of the respondent: his general health status, illnesses he may have, hospitalization in the last year</li> <li>•Health status of his family: illnesses</li> </ul>
Part 2 - 1: Presentation of illnesses	<ul style="list-style-type: none"> <li>•Description of the illnesses (in a random order)</li> <li>•Ranking of the illnesses according to their severity</li> <li>•Criteria used by the respondent for the ranking</li> </ul>
Part 2 - 2: Causes the illnesses	<ul style="list-style-type: none"> <li>•Depending on the questionnaire (cf. below):</li> <li>•question to know if the respondents know the causes of the illnesses</li> <li>•description of the causes</li> </ul>
Depending on the variant :	<ul style="list-style-type: none"> <li>•Baseline: no information</li> <li>•V2: air pollution only</li> <li>•V1: smoking+air pollution</li> <li>•V3: smoking only</li> </ul>
Part 3 : WTP determination	<ul style="list-style-type: none"> <li>•1st cough, random order for the 3 others illnesses - 1. description of the treatment; 2. choice between buying or not the treatment; 3. if yes: determination of the amount the respondent would be ready to pay, if not why</li> <li>•Questions about the WTP determination's process</li> </ul>
Part 4: Debriefing questions	<ul style="list-style-type: none"> <li>•Familiarity with paying for a medical treatment, risk of having the illnesses, how to avoid them, causes</li> <li>•Complement of part 2-follow-up: giving the name of the illnesses and the rest of the causes, possibility to change the WTP, reasons for the WTP</li> <li>•Relationship to risk and fear: regarding illnesses, at work, in leisure time, and in life in general</li> </ul>
Depending on the variant :	<ul style="list-style-type: none"> <li>•Baseline: air pollution + smoking</li> <li>•V2: other cause : smoking</li> <li>•V1: nothing</li> <li>•V3: other cause : air pollution</li> </ul>
Part 5: Socio-economic	<ul style="list-style-type: none"> <li>•Characteristics of the respondent and his household</li> </ul>

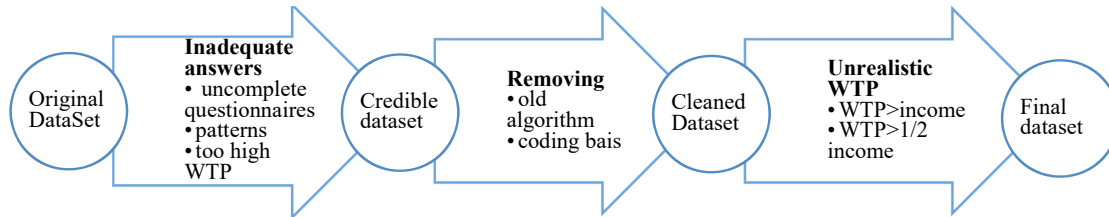
Figure 2: Design of the questionnaire

### 3.2 Sample

The questionnaire was administrated to a sample of 2000 people representative of the adult French population, part of the panel of IPSOS survey institute. Each respondent get only one variant of the questionnaire. Table 1 presents the distribution of the respondents between the four questionnaires, before and after data treatment, presented in Figure 3.

	Before data treatment		After data treatment	
	Frequency	Proportion	Frequency	Proportion
Baseline – no context	341	24.15%	229	23.3%
V1 – Full context	291	20.61%	175	17.8%
V2 – Air pollution	351	24.86%	247	25.1%
V3 - smoking	429	30.38%	333	33.8%
Total	1412	100%	984	100.0%

*Table 1: Repartition of the respondents according to the questionnaires*



*Figure 3: Data treatment*

### 3.3 Analyses of the results

The software used for the analysis IBM SPSS Advanced Statistics 25.0, with the SPSS plug-in STATS HECKMAN REGR; version 1.1.6 by Jon Peck (JKP. IBM SPSS; 2015).

First, unconditional statistics were conducted to assess the reactions of the respondents to the questionnaire, depending on the variants they got (meaning which context was given to explain the illnesses), and their smoking status (non-smoker, former smoker, smoker). Then, the interactions were considered with an econometric approach: probit for the probability of buying the treatment, lognormal for the value of the WTP and Heckman to combine both.

First, the respondents who chose not to pay to buy a treatment to avoid each illness will be analyzed, with focus on the reasons for not wanting to pay, the influence of the context given and the respondents' smoking status. Then, the WTP will be determined for each illness and the influence of the context and the respondents' characteristics will be determined.

## 4 Results and discussion

The influence of providing the causes of the illness may appear in various ways:

- ✓ Difference in the acceptability of the scenario: the part of protest answers may vary with the causes given. If less protest answers are observed when full context is provided, it may mean a realistic scenario increases the acceptability of the contingent valuation, and consequently increase the reliability of the willingness to pay (WTP).
- ✓ Differences in the WTP depending on the different information provided: respondents may change their valuation depending on the given information.
- ✓ Difference in the precision of the WTP: usually confidence intervals are quite wide. If giving contextualization induces smaller confidence interval, contextualization may lead to more accurate WTP.

#### **4.1 Paying or not?**

As the respondents were first asked if they agree to pay or not the treatment, and the reason why: respondents who really do not want to pay, called legit 0; or respondents who actually would pay for the treatment but do not because of other reasons, called protest answers. Two approaches were followed: unconditional statistics and modelling analysis (probit model, results presented in A1, Table 2 to Table 5). Both approaches lead to consistent results.

The main reason for agreeing to pay the treatment is the illness itself: respondents are more ready to pay for the more serious one. All the same, slightly less respondents willing to pay to avoid COPDs than for COPDm. It may be because COPDs is really life-impairing, letting suppose very high treatment costs, so more respondents think they cannot afford it, and would like to rely on the National Health Service, (a protest answer), or just state that they do not have enough income. On the bright side, it highlights that respondents truly thought about their resources when choosing to buy the treatment or not.

Context seems to have some influences: less protest are observed when full context is provided, then more when air pollution only is said to be the cause of COPD, more for smoking only, and even more when no causes at all are described.

Smoking status of the respondents lead to different behaviors: Smokers and non-smokers accept more the questionnaire than former smokers. Smokers refuse to pay more for legitimate reasons such as “I cannot afford the treatment” and “My health expenses are too high”, whereas former smokers are protesting more against the fact of paying. Non-Smokers show an intermediate response, close to the former smokers’ one. One reason may be that smokers accept their responsibility in their (possible) illness, whereas former smokers (and to some extent non-smokers) think they are not responsible and thus rely on the (quite efficient) French national health system. This analysis is supported by the result of the variant of the questionnaire providing smoking long context, and by the fact that respondents who have a good diet, think they may avoid the illness, have a private health insurance and donate to charitable society are more bound to pay

Nevertheless, the influence of smoking status is not statistically significant,

#### **4.2 If paying, how much?**

If respondents agree to buy the treatment, they are asked for how much. As for the previous part, two types of analyses were conducted: unconditional statistics and modelling analysis (lognormal model, results presented in A2, Table 6 to Table 9). Both approaches lead to consistent results.

Respondents are ready to pay more for the more serious illnesses, supporting the idea that they account for the possible cost of treatment and detrimental consequences they would experiment without it.

On the one hand, the different contexts provided do not seem to influence the WTP, and context is not a statistically significant variable.

On the other hand, the smoking status of the respondents affects their reaction to the questionnaire. Smokers are ready to pay less than non-smokers and than former smokers. However, significance varies with the analysis. The differences are statistically significant in the descriptive analysis for all illnesses but COPDs, in the modelling approach, smoking status of the respondents is significant only for COPDs (stepwise model) and COPDm (Full model). This may be explained by the fact respondents declared, for the COPDs, COPDm, and cough, that they thought about smoking as a possible cause of the illnesses and actually considered it when stating their WTP. That may be the reason why the causes given in the questionnaires do not really influence the WTP values. This hypothesis is strengthened by the fact that respondents also took into account, for the most serious illnesses, the fact that someone they care for smoke or smoked, and state a higher WTP in this case. So respondents probably took smoking into account in all variants of the questionnaire.

Moreover, the modelling approach with the lognormal model highlights that being aware of health risk through diet, air pollution or smoking (precisely quitting smoking, which may occur because of health risk), increases the WTP.

Other findings are consistent with usual observations: available resources are considered as households' income, the knowledge on which budget the payment will be made increases the WTP. Moreover, usual health budget, the perception of illness itself and constraints linked to the illnesses are considered, showing respondents do take into consideration their available budget and thus confirming the amounts they state are realistic.

The Heckman model does not show a large influence of the selection process (respondents willing to pay or not) on the WTP value, but it confirms the results of the previous analyses: importance of the income and knowing how to pay, being aware of health and environmental issues, and the low influence of context.

### **4.3 Discussion**

These results propose a way to reconcile the two trends in the literature: providing information on the causes increases the reliability of the valuation, without influencing the value itself.

However, in this case, the causes chosen were quite particular. They are in one way quite different: smoking is (mainly) a choice; breathing is not. However, they are mostly similar: both are linked to respiration, have long-term effect and are nowadays quite known by the population. So stating only one cause may also have increased the wariness of the respondents against the questionnaires. Therefore the low differences observed may be due to

the fact that some respondents considered both causes independently of the causes stated in the questionnaire.

It may also have led them to think at their behavior and life conditions in general, as being “healthy conscious” (having a good diet, exercising, and in some cases the level of pollution of the living area) influence the respondents.

Regarding the statistical aspects, extreme values have a high influence and may decrease the significance of the analysis, while possibly reflecting the major importance given by the respondents to their health. The low significance of the analysis may also come from the (relatively) small size of the sample, when considering specific characteristics of the respondents. Moreover, other parameters may influence the risk perception and respondents’ answers and have been disregarded here: culture, predisposition or education (Finkel, 2008). Indeed, for example, smokers are more inclined to take risks than non-smokers do (Viscusi and Aldy, 2003): other categories may have similar behavior and not been identified here.

## **5 Concluding remarks**

Providing the causes of the valued illness actually matches in the same time theory and previous observations: it does not fundamentally change the value, but it increases the acceptability of the questionnaire. It supports current practices of using the same values when assessing morbidity in when (quite) similar causes are considered.

Similar analyses with causes less known, or more different, would be interesting as other aspects of context have been observed leading to different reactions as shown by Ami et al. (2011, 2013, 2018) when studying ways to decrease the effects of air pollution on health. Moreover, cognitive bias may override other elements provided in the questionnaire, and consequently introduced uncertainties: respondents are less willing to pay when they think they can control the situation, whether this feeling is rational or not. So personal characteristics as well as elements influencing the perception and the responses to a contingent valuation questionnaire appear quite volatile and difficult to capture, even more when they interact. This makes the preferences quite difficult to assess. Other investigations may help to better identify the factors driving the apparent instability of the responses in contingent valuation questions, and in general in monetary valuation exercises, especially regarding psychology and behavioral drivers, and consequently improve the use of monetary valuation of non-marketed goods in the decision process.

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All remaining errors are my own.

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However, the content of this document is free of any control and reflects the opinions of the author and not those of EIFER, nor its members (EDF, KIT).

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1. A1: Probit model – Accepting to pay or not

		Estimation	Std Error	Wald	Sig.
	Constant	.228	.326	.489	.484
Parameters	Household Income	3.151E-5	2.342E-5	1.810	.178
	Context = no context	-.088	.130	.456	.500
	Context = full context	-.048	.137	.123	.726
	Context =Air pollution	.321	.133	5.835	.016
	Context =smoking	0 <sup>a</sup>	.	.	.
	Sport = Every day	-.138	.208	.438	.508
	Sport = Several times a week	.119	.159	.557	.455
	Sport = Several times a month	.440	.171	6.666	.010
	Sport = Only rarely	.120	.150	.643	.423
	Sport = Never	0 <sup>a</sup>	.	.	.
	Diet = Better than average	.496	.206	5.807	.016
	Diet = About average	.392	.179	4.801	.028
	Diet = Below average	0 <sup>a</sup>	.	.	.
	Smoker	-.140	.144	.949	.330
	Non -Smoker	-.119	.121	.961	.327
	Former Smoker	0 <sup>a</sup>	.	.	.
	Think illness avoidable = no answer	4.681	.000	.	.
	Think illness avoidable = Yes	.399	.103	15.070	.000
	Think illness avoidable = No	0 <sup>a</sup>	.	.	.
	Sex = Male	-.252	.101	6.243	.012
	Sex = Female	0 <sup>a</sup>	.	.	.
	Main occupation = no answer	5.744	7582.739	.000	.999
	Main occupation = Liberal	.291	.354	.674	.412
	Main occupation = Fulltime employee	.411	.237	3.011	.083
	Main occupation = Part-time employee	.309	.273	1.277	.258
	Main occupation = Student	.740	.300	6.079	.014
	Main occupation = Housewife/husband	.894	.390	5.250	.022
	Main occupation = Retired	-.187	.246	.577	.447
	Main occupation = None	.169	.268	.397	.529
	Main occupation = Medical/disability leave	-.168	.410	.167	.683
Main occupation = Other	0 <sup>a</sup>	.	.	.	
Occupation related health = Yes	.312	.165	3.592	.058	
Occupation related health = No	0 <sup>a</sup>	.	.	.	

Table 2: COPDs – Pay or not – Probit scarce model  
*Pseudo R<sup>2</sup>(McFadden) = 0.095, N = 984, In grey: Statistically significant parameters*

		Estimation	Standard error	Wald	Sig.
	Constant	.352	.291	1.460	.227
Parameters	Household Income	2.724E-5	2.302E-5	1.401	.237
	Context = no context	-.101	.171	.344	.558
	Context = full context	-.204	.134	2.328	.127
	Context =Air pollution	.050	.168	.090	.765
	Context =smoking	0 <sup>a</sup>	.	.	.
	Sport = Every day	-.122	.205	.352	.553
	Sport = Several times a week	.160	.156	1.052	.305
	Sport = Several times a month	.362	.164	4.842	.028
	Sport = Only rarely	.152	.147	1.063	.302
	Sport = Never	0 <sup>a</sup>	.	.	.

Smoker	-.098	.140	.490	.484
Non -Smoker	-.097	.118	.679	.410
Former Smoker	0 <sup>a</sup>	.	.	.
Think illness avoidable = no answer	5.033	.000	.	.
Think illness avoidable = Yes	.486	.099	23.856	.000
Think illness avoidable = No	0 <sup>a</sup>	.	.	.
Risky leisure = Yes	.632	.339	3.480	.062
Risky leisure = No	0 <sup>a</sup>	.	.	.
Sex = Male	-.203	.098	4.312	.038
Sex = Female	0 <sup>a</sup>	.	.	.
Main occupation = no answer	5.755	7409.468	.000	.999
Main occupation = Liberal	.598	.359	2.783	.095
Main occupation = Fulltime employee	.462	.228	4.099	.043
Main occupation = Part-time employee	.387	.263	2.167	.141
Main occupation = Student	.600	.275	4.762	.029
Main occupation = Housewife/husband	.836	.362	5.324	.021
Main occupation = Retired	-.058	.240	.058	.810
Main occupation = None	.407	.261	2.433	.119
Main occupation = Medical/disability leave	.418	.426	.962	.327
Main occupation = Other	0 <sup>a</sup>	.	.	.
Donation charity last year = Yes	.269	.124	4.672	.031
Donation charity last year = No	0 <sup>a</sup>	.	.	.
Health insurance = Yes	.265	.129	4.214	.040
Health insurance = No	0 <sup>a</sup>	.	.	.

Table 3: COPDm – Pay or not – Probit scarce model  
*Pseudo R<sup>2</sup>(McFadden) = 0.084, N = 984, In grey: Statistically significant parameters*

		Estimation	Standard Error	Wald	Sig.
	Constant	.653	.314	4.337	.037
Parameters	Household Income	2.301E-5	2.151E-5	1.145	.285
	Context = no context	.082	.164	.253	.615
	Context = full context	-.168	.128	1.724	.189
	Context =Air pollution	.138	.160	.741	.389
	Context =smoking	0 <sup>a</sup>	.	.	.
	Diet = Better than average	.327	.195	2.814	.093
	Diet = About average	.227	.172	1.739	.187
	Diet = Below average	0 <sup>a</sup>	.	.	.
	Smoker	-.045	.134	.113	.736
	Non -Smoker	-.134	.112	1.421	.233
	Former Smoker	0 <sup>a</sup>	.	.	.
	Think illness avoidable = no answer	5.299	.000	.	.
	Think illness avoidable = Yes	.342	.096	12.763	.000
	Think illness avoidable = No	0 <sup>a</sup>	.	.	.
	Sex = Male	-.211	.093	5.127	.024
	Sex = Female	0 <sup>a</sup>	.	.	.
	Main occupation = no answer	-.061	.927	.004	.947
	Main occupation = Liberal	.927	.351	6.984	.008
	Main occupation = Fulltime employee	.678	.219	9.589	.002
	Main occupation = Parttime employee	.502	.250	4.023	.045

Main occupation = Student	.656	.258	6.444	.011
Main occupation = Housewife/husband	.708	.324	4.764	.029
Main occupation = Retired	.307	.231	1.761	.184
Main occupation = None	.418	.249	2.817	.093
Main occupation = Medical/disability leave	.458	.401	1.307	.253
Main occupation = Other	0 <sup>a</sup>	.	.	.
Donation charity last year = Yes	.206	.117	3.103	.078
Donation charity last year = No	0 <sup>a</sup>	.	.	.
Health insurance = Yes	.269	.123	4.752	.029
Health insurance = No	0 <sup>a</sup>	.	.	.

Table 4: CB – Pay or not – Probit scarce model  
*Pseudo R<sup>2</sup>(McFadden) = 0.087, N = 984, In grey: Statistically significant parameters*

	Estimation	Standard Error	Wald	Sig.
Constant	-24.183	9.151	6.983	.008
Birth year	.013	.005	7.369	.007
Household size	.096	.033	8.305	.004
Household Income	-1.908E-5	2.001E-5	.909	.340
Context = no context	.095	.154	.379	.538
Context = full context	-.016	.122	.017	.897
Context =Air pollution	-.049	.148	.107	.743
Context =smoking	0 <sup>a</sup>	.	.	.
Health = Well above average	-.830	.363	5.241	.022
Health = Above average	-.741	.341	4.735	.030
Health = Average	-.644	.330	3.807	.051
Health = Below average	-.736	.346	4.508	.034
Health = Well below average	0 <sup>a</sup>	.	.	.
Diet = Better than average	.384	.198	3.761	.052
Diet = About average	.323	.179	3.270	.071
Diet = Below average	0 <sup>a</sup>	.	.	.
Smoker	.107	.126	.724	.395
Non -Smoker	.035	.106	.110	.740
Former Smoker	0 <sup>a</sup>	.	.	.
Think illness avoidable = no answer	6.030	.000	.	.
Think illness avoidable = Yes	.163	.094	3.012	.083
Think illness avoidable = No	0 <sup>a</sup>	.	.	.
Risky leisure = Yes	.409	.250	2.690	.101
Risky leisure = No	0 <sup>a</sup>	.	.	.
Main occupation = no answer	-6.226	.000	.	.
Main occupation = Liberal	.250	.322	.600	.438
Main occupation = Fulltime employee	.382	.223	2.940	.086
Main occupation = Parttime employee	.246	.249	.976	.323
Main occupation = Student	.199	.277	.514	.473
Main occupation = Housewife/husband	.600	.311	3.732	.053
Main occupation = Retired	.166	.247	.449	.503
Main occupation = None	.189	.254	.555	.456
Main occupation = Medical/disability leave	.075	.402	.035	.851
Main occupation = Other	0 <sup>a</sup>	.	.	.
Donation charity last year = Yes	.193	.110	3.073	.080
Donation charity last year = No	0 <sup>a</sup>	.	.	.

Health insurance = Yes	.269	.117	5.318	.021
Health insurance = No	0 <sup>a</sup>	.	.	.

**Table 5: Cough – Pay or not – Probit scarce model**  
*Pseudo R<sup>2</sup>(McFadden) = 0.047, N = 984, In grey: Statistically significant parameters*

## 2. A2: WTP - Lognormal model

**Table 6: COPDs WTP – Lognormal model**  
*R<sup>2</sup>adjusted = 0.443, sample size 674, In grey: sigma <0.1*

COPDs					
	Coefficients non standard		Coefficients standard	t	Sig.
	B	Standard error	Bêta		
(Constant)	-3.454	3.393		-1.018	.309
Context = full context	-.074	.071	-.049	-1.038	.300
Context =Air pollution	-.061	.053	-.048	-1.161	.246
Context =smoking	-.085	.065	-.072	-1.312	.190
Health = Well above average	.020	.070	.009	.293	.770
Health = Above average	-.011	.046	-.008	-.237	.813
Health = Below average	.069	.058	.038	1.180	.239
Health = Well below average	.241	.140	.056	1.723	.085
Preexisting condition: Chronic bronchitis	-.024	.123	-.006	-.198	.843
Hospital last year	-.011	.137	-.002	-.079	.937
WTP: 1 <sup>st</sup> proposed amount COPDs	2.109E-5	.000	.051	1.659	.098
WTP: lowest proposed amount COPDs	.001	.000	.537	15.755	.000
WTP: highest proposed amount COPDs	-6.696E-6	.000	-.014	-.420	.675
WTP criteria: illness duration	-.005	.035	-.004	-.142	.887
WTP criteria: other	-.005	.020	-.008	-.271	.786
WTP criteria: comparison with usual health expenses	.083	.026	.108	3.238	.001
WTP criteria: pain	-.063	.039	-.051	-1.590	.112
WTP criteria: living standard	.040	.030	.043	1.314	.189
WTP criteria: long term effects of the illness	-.094	.038	-.081	-2.494	.013
Planning to pay – personal income	.050	.041	.044	1.227	.220
Planning to pay - savings	-.011	.060	-.006	-.183	.855
Planning to pay – other	-.283	.075	-.125	-3.759	.000
Sport = Every day	.092	.089	.040	1.030	.303
Sport = Several times a week	.022	.065	.017	.338	.736
Sport = Several times a month	.067	.065	.051	1.038	.300
Sport = Only rarely	-.014	.062	-.012	-.231	.818
Dwelling = Heavily air polluted	-.038	.080	-.017	-.473	.636
Dwelling = Somewhat air polluted	-.037	.056	-.027	-.661	.509
Dwelling = Slightly air polluted	-.007	.048	-.006	-.145	.885
Diet = better than average	.013	.043	.009	.294	.769
Diet = below than average	.022	.079	.009	.278	.781
Smoker	-.049	.054	-.035	-.907	.365
Non-Smoker	-.071	.045	-.063	-1.596	.111
Difficulties to assess WTP – I do not know my usual health expenses	-.083	.047	-.057	-1.765	.078
Difficulties to assess WTP – I do not know how much costs medicaments	.017	.037	.015	.461	.645
Difficulties to assess WTP – I have difficulties to imagine constraints due to these illnesses	.061	.034	.057	1.823	.069
Difficulties to assess WTP – I have difficulties to imagine what proposed amounts represent	.056	.038	.046	1.465	.143

Difficulties to assess WTP – illnesses are similar	-.097	.064	-.049	-1.506	.132
Difficulties to assess WTP – proposed amounts do not fit	-.008	.047	-.006	-.178	.859
Think you can avoid these illnesses	-.053	.043	-.040	-1.230	.219
You think illnesses caused by air pollution and smoking	.031	.059	.017	.536	.592
You think illnesses caused by smoking	.094	.043	.073	2.186	.029
You think illnesses caused by air pollution	.007	.056	.004	.126	.899
WTP – Thought about smoking but no influence	-.077	.044	-.067	-1.753	.080
WTP – Thought about smoking and influence	-.023	.059	-.016	-.396	.692
WTP – Thought about air pollution but no influence	.070	.043	.059	1.613	.107
WTP – Thought about air pollution and influence	.029	.063	.017	.458	.647
WTP – Thought about prevention program	.076	.044	.060	1.740	.082
WTP – Thought about the costs of these illnesses for society	-.006	.044	-.005	-.135	.893
Knowing that this kind of respiratory problems could become so serious	.037	.035	.032	1.046	.296
1 Relative smoker	-.043	.038	-.037	-1.138	.256
Risky occupation	.001	.044	.001	.018	.986
Risky leisure	.143	.099	.044	1.446	.149
Sex	-.064	.037	-.056	-1.747	.081
Birth year	.002	.002	.057	1.399	.162
Household size < 15 years old	.010	.022	.015	.441	.659
Marital status = Married	.072	.050	.061	1.436	.152
Marital status = Divorced	-.021	.073	-.011	-.291	.772
Marital status = Widower	-.003	.135	-.001	-.020	.984
Education = A-level	.135	.048	.102	2.800	.005
Education = A-level+2	.139	.054	.097	2.599	.010
Education = Bachelor	.146	.070	.073	2.094	.037
Education = Master +	.153	.066	.086	2.329	.020
Occupation related to health	-.019	.052	-.011	-.366	.715
Donation charity last year	.039	.046	.033	.851	.395
Health insurance	-.043	.049	-.036	-.872	.383
Log Household Income	.105	.076	.052	1.387	.166

Table 7: COPDm WTP – Lognormal model  
*R<sup>2</sup>adjusted = 0.214, sample size 657, In grey: sigma <0.1*

COPDm					
	Coefficients non standard		Coefficients standard	t	Sig.
	B	Standard error	Bêta		
(Constant)	-1.893	3.506		-.540	.589
Context = full context	.004	.075	.003	.049	.961
Context =Air pollution	.037	.055	.034	.681	.496
Context =smoking	.053	.067	.052	.789	.430
Health = Well above average	-.012	.075	-.006	-.159	.874
Health = Above average	.002	.047	.002	.049	.961



Health = Below average	.068	.062	.042	1.099	.272
Health = Well below average	.147	.138	.042	1.061	.289
Preexisting condition: Chronic bronchitis	-.062	.125	-.019	-.499	.618
Hospital last year	-.139	.142	-.037	-.977	.329
WTP: 1 <sup>st</sup> proposed amount CODPm	2.104E-5	.000	.057	1.553	.121
WTP: lowest proposed amount CODPm	.001	.000	.346	8.826	.000
WTP: highest proposed amount CODPm	-4.422E-6	.000	-.011	-.280	.780
WTP criteria: illness duration	.014	.037	.014	.377	.707
WTP criteria: other	.023	.022	.037	1.023	.307
WTP criteria: comparison with usual health expenses	.038	.026	.057	1.429	.154
WTP criteria: pain	.005	.039	.005	.120	.905
WTP criteria: living standard	.036	.031	.045	1.154	.249
WTP criteria: long term effects of the illness	-.034	.038	-.034	-.893	.372
Planning to pay – personal income	.010	.043	.010	.222	.825
Planning to pay - savings	.090	.060	.061	1.483	.138
Planning to pay – other	-.214	.086	-.096	-2.486	.013
Sport = Every day	.137	.092	.069	1.492	.136
Sport = Several times a week	.039	.067	.037	.589	.556
Sport = Several times a month	.053	.067	.046	.782	.435
Sport = Only rarely	.026	.065	.025	.401	.688
Dwelling = Heavily air polluted	.133	.082	.072	1.627	.104
Dwelling = Somewhat air polluted	.097	.058	.084	1.670	.096
Dwelling = Slightly air polluted	.047	.050	.049	.941	.347
Diet = better than average	.011	.046	.009	.243	.808
Diet = below than average	-.024	.079	-.012	-.306	.760
Smoker	-.096	.056	-.081	-1.721	.086
Non-Smoker	-.044	.047	-.044	-.930	.353
Difficulties to assess WTP – I do not know my usual health expenses	-.031	.049	-.024	-.634	.527
Difficulties to assess WTP – I do not know how much costs medicaments	-.046	.038	-.046	-1.202	.230
Difficulties to assess WTP – I have difficulties to imagine constraints due to these illnesses	.063	.035	.069	1.826	.068
Difficulties to assess WTP – I have difficulties to imagine what proposed amounts represent	.030	.040	.029	.765	.445
Difficulties to assess WTP – illnesses are similar	.038	.070	.022	.552	.581
Difficulties to assess WTP – proposed amounts do not fit	-.026	.050	-.020	-.527	.598
Think you can avoid these illnesses	-.049	.043	-.044	-1.139	.255
You think illnesses caused by air pollution and smoking	.043	.062	.027	.686	.493
You think illnesses caused by smoking	-.005	.044	-.005	-.117	.907
You think illnesses caused by air pollution	-.004	.057	-.003	-.077	.938
WTP – Thought about smoking but no influence	-.017	.047	-.018	-.374	.709
WTP – Thought about smoking and influence	.083	.061	.066	1.371	.171
WTP – Thought about air pollution but no influence	.042	.045	.041	.938	.349
WTP – Thought about air pollution and influence	-.016	.067	-.011	-.235	.814
WTP – Thought about prevention program	.041	.046	.037	.896	.371
WTP – Thought about the costs of theses illnesses for society	.020	.045	.018	.444	.657

Knowing that this kind of respiratory problems could become so serious	.008	.037	.008	.225	.822
1 Relative smoker	-.075	.039	-.075	-1.930	.054
Risky occupation	-.011	.046	-.009	-.226	.821
Risky leisure	.190	.102	.069	1.868	.062
Sex	-.056	.039	-.057	-1.462	.144
Birth year	.001	.002	.036	.735	.462
Household size < 15 years old	-.005	.022	-.008	-.208	.836
Marital status = Married	-.025	.052	-.024	-.482	.630
Marital status = Divorced	-.103	.075	-.061	-1.369	.172
Marital status = Widower	.098	.137	.027	.719	.472
Education = A-level	.097	.051	.085	1.910	.057
Education = A-level+2	.066	.055	.055	1.212	.226
Education = Bachelor	.078	.074	.045	1.059	.290
Education = Master +	.119	.068	.078	1.752	.080
Occupation related to health	.032	.054	.022	.580	.562
Donation charity last year	.036	.048	.035	.758	.449
Health insurance	-.004	.051	-.004	-.085	.932
Log Household Income	.254	.079	.142	3.216	.001

Table 8 CB WTP – Lognormal model  
*R<sup>2</sup>adjusted = 0.201, sample size 623, In grey: sigma <0.1*

CB					
	Coefficients non standard		Coefficients standard	t	Sig.
	B	Standard error	Bêta		
(Constant)	.779	3.822		.204	.839
Context = full context	-.071	.082	-.050	-.862	.389
Context =Air pollution	-.008	.059	-.007	-.134	.894
Context =smoking	-.101	.073	-.095	-1.390	.165
Health = Well above average	-.005	.079	-.003	-.067	.947
Health = Above average	-.062	.052	-.049	-1.204	.229
Health = Below average	.049	.068	.028	.720	.472
Health = Well below average	.115	.152	.031	.755	.450
Preexisting condition: Chronic bronchitis	-.107	.124	-.034	-.864	.388
Hospital last year	-.041	.150	-.011	-.274	.784
WTP: 1 <sup>st</sup> proposed amount CB	4.856E-5	.000	.120	3.152	.002
WTP: lowest proposed amount CB	.001	.000	.326	8.352	.000
WTP: highest proposed amount CB	5.705E-5	.000	.110	2.852	.005
WTP criteria: illness duration	.019	.039	.019	.475	.635
WTP criteria: other	.023	.025	.036	.932	.352
WTP criteria: comparison with usual health expenses	.021	.029	.030	.721	.471
WTP criteria: pain	-.016	.043	-.014	-.361	.719
WTP criteria: living standard	.015	.034	.018	.447	.655
WTP criteria: long term effects of the illness	-.065	.042	-.062	-1.545	.123
Planning to pay – personal income	.052	.046	.051	1.124	.261
Planning to pay - savings	.061	.066	.039	.925	.355
Planning to pay – other	-.166	.088	-.076	-1.886	.060
Sport = Every day	.132	.097	.065	1.356	.176

Sport = Several times a week	.017	.072	.015	.236	.813
Sport = Several times a month	.096	.072	.078	1.336	.182
Sport = Only rarely	.055	.069	.050	.802	.423
Dwelling = Heavily air polluted	.026	.091	.013	.283	.777
Dwelling = Somewhat air polluted	.014	.062	.012	.224	.823
Dwelling = Slightly air polluted	.005	.054	.005	.090	.928
Diet = better than average	.028	.048	.023	.583	.560
Diet = below than average	-.052	.086	-.024	-.600	.548
Smoker	-.080	.060	-.065	-1.335	.182
Non-Smoker	-.055	.050	-.054	-1.097	.273
Difficulties to assess WTP – I do not know my usual health expenses	-.058	.052	-.045	-1.124	.261
Difficulties to assess WTP – I do not know how much costs medicaments	-.047	.043	-.044	-1.096	.274
Difficulties to assess WTP – I have difficulties to imagine constraints due to these illnesses	.030	.038	.031	.799	.425
Difficulties to assess WTP – I have difficulties to imagine what proposed amounts represent	-.008	.044	-.007	-.186	.852
Difficulties to assess WTP – illnesses are similar	-.004	.072	-.002	-.054	.957
Difficulties to assess WTP – proposed amounts do not fit	.029	.052	.022	.562	.574
Think you can avoid these illnesses	-.090	.046	-.077	-1.933	.054
You think illnesses caused by air pollution and smoking	-.037	.066	-.023	-.562	.575
You think illnesses caused by smoking	.066	.048	.057	1.370	.171
You think illnesses caused by air pollution	.011	.063	.007	.168	.866
WTP – Thought about smoking but no influence	.008	.051	.008	.162	.871
WTP – Thought about smoking and influence	.100	.065	.076	1.533	.126
WTP – Thought about air pollution but no influence	.007	.049	.007	.144	.885
WTP – Thought about air pollution and influence	-.009	.072	-.006	-.126	.900
WTP – Thought about prevention program	-.012	.051	-.010	-.228	.820
WTP – Thought about the costs of these illnesses for society	.061	.049	.053	1.235	.217
Knowing that this kind of respiratory problems could become so serious	-.012	.040	-.012	-.296	.767
I Relative smoker	-.025	.043	-.024	-.584	.559
Risky occupation	-.021	.051	-.016	-.404	.687
Risky leisure	.249	.111	.086	2.239	.026
Sex	-.072	.042	-.070	-1.723	.085
Birth year	.000	.002	-.003	-.057	.954
Household size < 15 years old	.002	.024	.004	.097	.923
Marital status = Married	-.035	.056	-.033	-.622	.534
Marital status = Divorced	-.177	.081	-.100	-2.168	.031
Marital status = Widower	-.020	.140	-.006	-.141	.888
Education = A-level	.109	.055	.091	1.990	.047
Education = A-level+2	.087	.060	.067	1.442	.150
Education = Bachelor	.161	.078	.091	2.056	.040
Education = Master +	.186	.077	.113	2.426	.016
Occupation related to health	.090	.060	.059	1.507	.132
Donation charity last year	.093	.053	.086	1.766	.078
Health insurance	-.069	.056	-.064	-1.236	.217
Log Household Income	.167	.087	.089	1.922	.055

**Table 9: Cough WTP – Lognormal model**  
*R<sup>2</sup>adjusted = 0.393, sample size 401, In grey: sigma <0.1*

<b>Cough</b>					
	<b>Coefficients non standard</b>		<b>Coefficients standard</b>	<b>t</b>	<b>Sig.</b>
	<b>B</b>	<b>Standard error</b>	<b>Bêta</b>		
(Constant)	3.888	3.465		1.122	.263
Context = full context	.121	.072	.108	1.677	.094
Context =Air pollution	.022	.056	.022	.396	.692
Context =smoking	.041	.066	.046	.613	.541
Health = Well above average	.043	.076	.024	.561	.575
Health = Above average	.009	.046	.008	.189	.850
Health = Below average	.046	.060	.032	.764	.445
Health = Well below average	-.062	.116	-.024	-.539	.590
Preexisting condition: Chronic bronchitis	-.019	.101	-.008	-.191	.849
Hospital last year	.024	.115	.009	.208	.836
WTP: 1 <sup>st</sup> proposed amount Cough	3.177E-5	.000	.005	.118	.906
WTP: lowest proposed amount Cough	.007	.000	.621	13.240	.000
WTP: highest proposed amount Cough	1.946E-5	.000	.057	1.201	.230
WTP criteria: illness duration	.008	.036	.010	.233	.816
WTP criteria: other	.017	.020	.036	.846	.398
WTP criteria: comparison with usual health expenses	-.029	.027	-.048	-1.076	.283
WTP criteria: pain	-.052	.038	-.059	-1.357	.176
WTP criteria: living standard	.039	.031	.055	1.253	.211
WTP criteria: long term effects of the illness	.012	.038	.014	.323	.747
Planning to pay – personal income	.081	.041	.095	1.966	.050
Planning to pay - savings	.058	.058	.045	.987	.324
Planning to pay – other	-.123	.073	-.075	-1.698	.090
Sport = Every day	.025	.086	.015	.296	.768
Sport = Several times a week	.036	.064	.039	.563	.574
Sport = Several times a month	.107	.065	.102	1.639	.102
Sport = Only rarely	.039	.062	.041	.619	.536
Dwelling = Heavily air polluted	.026	.081	.016	.320	.749
Dwelling = Somewhat air polluted	-.090	.055	-.088	-1.621	.106
Dwelling = Slightly air polluted	-.068	.048	-.080	-1.424	.155
Diet = better than average	.046	.043	.046	1.069	.286
Diet = below than average	-.122	.087	-.059	-1.402	.162
Smoker	.006	.054	.006	.115	.909
Non-Smoker	-.001	.045	-.001	-.019	.985
Difficulties to assess WTP – I do not know my usual health expenses	.003	.045	.002	.058	.954
Difficulties to assess WTP – I do not know how much costs medicaments	-.008	.037	-.009	-.228	.820
Difficulties to assess WTP – I have difficulties to imagine constraints due to these illnesses	-.010	.033	-.012	-.300	.764
Difficulties to assess WTP – I have difficulties to imagine what proposed amounts represent	-.001	.038	-.001	-.029	.977
Difficulties to assess WTP – illnesses are similar	-.026	.064	-.018	-.410	.682
Difficulties to assess WTP – proposed amounts do not fit	-.013	.048	-.011	-.263	.793

<b>Think you can avoid these illnesses</b>	-0.041	.041	-.044	-1.013	.312
<b>You think illnesses caused by air pollution and smoking</b>	-.023	.061	-.017	-.371	.711
<b>You think illnesses caused by smoking</b>	.038	.044	.040	.873	.383
<b>You think illnesses caused by air pollution</b>	-.046	.057	-.036	-.797	.426
<b>WTP – Thought about smoking but no influence</b>	-.034	.045	-.039	-.762	.447
<b>WTP – Thought about smoking and influence</b>	.013	.058	.012	.220	.826
<b>WTP – Thought about air pollution but no influence</b>	.019	.045	.022	.438	.662
<b>WTP – Thought about air pollution and influence</b>	.048	.063	.041	.774	.439
<b>WTP – Thought about prevention program</b>	.028	.044	.030	.642	.521
<b>WTP – Thought about the costs of these illnesses for society</b>	-.031	.043	-.033	-.720	.472
<b>Knowing that this kind of respiratory problems could become so serious</b>	.011	.036	.013	.307	.759
<b>1 Relative smoker</b>	-.016	.038	-.019	-.426	.671
<b>Risky occupation</b>	.025	.047	.023	.525	.600
<b>Risky leisure</b>	-.058	.098	-.024	-.587	.558
<b>Sex</b>	-.013	.037	-.016	-.364	.716
<b>Birth year</b>	-.001	.002	-.042	-.795	.427
<b>Household size &lt; 15 years old</b>	.004	.020	.009	.198	.843
<b>Marital status = Married</b>	-.062	.052	-.068	-1.189	.235
<b>Marital status = Divorced</b>	-.056	.073	-.038	-.761	.447
<b>Marital status = Widower</b>	-.161	.119	-.059	-1.351	.178
<b>Education = A-level</b>	.053	.050	.052	1.056	.292
<b>Education = A-level+2</b>	-.025	.052	-.023	-.479	.632
<b>Education = Bachelor</b>	-.008	.068	-.005	-.114	.909
<b>Education = Master +</b>	.021	.069	.015	.306	.760
<b>Occupation related to health</b>	.108	.055	.080	1.955	.051
<b>Donation charity last year</b>	-.001	.046	-.001	-.028	.978
<b>Health insurance</b>	-.021	.053	-.023	-.404	.687
<b>Log Household Income</b>	-.065	.087	-.039	-.739	.460