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VALUING HEALTH RISK REDUCTIONS: A STUDY OF INDUSTRIAL COMMUNITY IN J&K

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ABSTRACT

Theoretically appropriate way of estimating the value of the benefits of risk reduction policies is to estimate the WTP for risk reduction by the affected population. This study attempts to estimate the wiliness to pay (WTP) for reducing the risk of chronic bronchitis using contingent valuation method and check whether magnitude of risk does have any impact on WTP estimates. The study was conducted in an industrial community affected by cement pollution in Khrew town of Jammu and Kashmir (India). The results reveal that WTP was statistically insignificant to the magnitude of risk reduction. The mean WTP was estimated to be Rs. 360 and the Value of Statistical Case of Chronic Bronchitis turns out to be Rs. 18040. The study provides WTP based estimates of Chronic Bronchitis for monetary valuation of environmental health policies.

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INTRODUCTION

Chronic illness characteristics are difficult to measure and quantify like acute illness as there are no well defined endings and beginnings. Duration is of longer periods or sometimes remains for lifetime. Values for avoiding chronic illness (and mortality) are generally appropriately derived in literature, that is they are ex-ante and assume the event occurs probabilistically (Alberini and Krupnick 2003). In such cases the good being valued is the reduction in the probability of adverse health outcomes rather than certainty of such outcomes. The theoretically appropriate way of estimating the value of the benefits of risk reduction policies is to estimate the WTP for risk reduction by the affected population (Viscusi and Gayer 2005). To determine whether risk reduction measures lead to the improvements in welfare, it is important to measure the benefits of reductions/changes in risk. One approach of eliciting the benefits of risk reductions is to seek respondent's willingness to trade-off their income for the reduction in the risk of chronic disease. These risk-income trade-offs provide direct estimates of WTP. Another approach is to use risk-risk trade-offs and these risk-risk trade-offs are converted into monetary values using the value of statistical lives/cases (Viscusi *et al*. 1991, Krupnick and Cropper 1992). Value of statistical case of chronic bronchitis (VSCB) is analogous to the value of statistical life (VSL) wherein the statistical case of CB/life reduced is not known with certainty but probabilistically. The VSCB avoided or VSL saved is estimated by dividing the WTP estimates for certain risk reduction by the magnitude of risk reduction for a particular size of exposed population, i.e. VSCB = WTP/Risk reduction.

The risk-money trade-offs attempts to elicit respondents WTP for an exogenous change in the risk of chronic bronchitis, that is the rate at which they are willing to trade income for lower chronic disease risk. It is convenient to Model chronic illness in terms of state dependent utilities (Freeman 2003). The state dependent utility Model for valuing Chronic Bronchitis risk reduction has been applied by Viscusi *et al*. (1991), Krupnick and Cropper (1992) and Hammitt and Zhou (2006). There are two main ways to derive value of statistical life (VSL) or trade-off between wealth and risk- revealed preferences or stated preferences. Revealed preference studies are based on compensating wage data (labour market) or consumer behaviour and had wide applications in non-environmental context (Viscusi 1993). Stated preference method assesses the value of non-market goods by using individuals' stated behaviour in a hypothetical setting, and includes number of different approaches such as Contingent Valuation Method (CVM), Conjoint Analysis and Choice Experiments. Stated preference methodology has considerable appeal for the valuation of health risks. A major advantage of using stated preference methodology is that it allows us to value health risks that do not necessarily have a direct link to the observable market activities. The limited studies available on chronic bronchitis risk reduction valuation are mostly based on

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stated preference methods and confined to the developed countries. Some of them have used computer iteration-based methods to elicit respondent's risk-money and risk-risk tradeoffs (Viscussi *et al*., 1991, Magat *et al*., 1996). However, given the resource and context constrains such studies have not been conducted in developing countries like India. Therefore, our aim is to conduct an experimental study for checking the feasibility of such complex risk reduction valuation studies in a cement manufacturing area of Khrew in J&K (India). We employed the CV survey to seek directly peoples WTP for reduction of the risk of chronic bronchitis prevalence and test empirically the sensitiveness of WTP responses to the magnitude of risk reduction in the case area (Scale/Scope Test).

METHODS AND MATERIALS

Contingent Valuation Survey: The prevalence of chronic bronchitis in the case area is 8% or (8/100 persons) which is very high. We attempt to estimate the WTP for the reduction of the prevalence of CB in Khrew. For estimating the value of statistical case of chronic bronchitis, we employed the contingent valuation approach by directly eliciting respondents WTP for risk reduction of chronic bronchitis. The CV method constructs a hypothetical market with a desired provision structure and payment vehicle for a very wide range of public or private goods. The goods that have been valued by the CV method include environmental amenities, resources, and health risks. The contingent valuation method (CVM) asks people to state their values directly, rather than inferring values from actual choices. People are asked to state their maximum willingness to pay (WTP) for some environmental service or to state their minimum to accept compensation (WTAC). Applying CVM for valuing risk reductions is fraught with many shortcomings like communication of risk stated as small probabilities, setting of hypothetical markets, payment vehicle and methods of elicitation. We designed a standard CV survey to fulfill the requirements of the study / objectives. The survey description is discussed below:

Target population: The target population for the present study is the adult residents of Khrew town of District Pulwama (J&K). Khrew is an industrial town with almost 11 cement plants functioning in the surrounding vicinity. The total population of this small town is 7166 souls (Census 2001). The annual air pollution (PM_{10}) level during 2009-10 was recorded 98 $\mu g/m^3$ which is almost by 100% above the WHO standard (50 $\mu g/m^3$) as well as above the national ambient air quality standards (60 $\mu g/m^3$). Air pollution has been associated with both acute and chronic respiratory illness. The annual data from Primary Health Centre at Khrew showed the out of total 8215 outpatient cases/visits 615 (7.53%) had been diagnosed as Bronchitis. However, the data are not segregated for acute and chronic cases of Bronchitis. The figures may be underestimates because many people visit nearby urban areas and private physicians for medical treatment. In 2009-10 we conducted a primary survey in Khrew town for acute respiratory illness prevalence and to control for chronic illness conditions we collected data on the prevalence of chronic bronchitis. The chronic bronchitis cases were identified on the basis of symptoms and the standard definition was prevalence of cough with mucus for three months or more and repeatedly for two consecutive years. The prevalence was found to be 8% (8/100). We used this prevalence rate as the baseline reference risk of developing chronic bronchitis and attempted to value the CB risk reductions using CV survey. We attempted to see the sensitiveness of WTP responses to the magnitude of risk reduction. We used split sampling technique. In this experiment half of the respondents were offered randomly the 3% reduction in risk and other half were offered 1% reduction in risk of developing CB. A CV questionnaire was designed for collecting the required data from the case area.

Contingent Valuation questionnaire: Contingent Valuation questionnaire was designed to fulfill the standard requirements of CV surveys and mainly consists of three parts. In CV surveys the good/service to be valued should be familiar to the respondents and respondents need to be provided with information/ awareness about the good. The first part of the questionnaire started with some warm up questions and mainly had two categories of questions. The first category was confined to the presence of chronic bronchitis related symptoms, if any, among the respondents.

These questions were put up to attain two objectives: To find the prevalence of chronic bronchitis among the selected respondents and to make respondents aware about the chronic bronchitis symptoms. The second category of the questions was devoted to the risk communication test. As the survey attempts to value small risk reductions which are generally probabilities and communicating small risks is the serious challenge in such studies. Researchers often try to communicate the magnitude of small risks using visual aids, graphs, dots etc. (Mitchell and Carson 1986; Smith and Desvousges 1987, Carso *et al*., 2001 and Hammit and Zhou 2006). In order to communicate small risks (probabilities) and to ensure that these probabilities are understood by the respondents, we conducted a risk communication test. We present respondents with the probabilities of the bronchitis that prevailed in the Khrew and surrounding three villages during 2009-10 and respondents were asked to rank the area with highest prevalence and lowest prevalence. For illiterate respondents the enumerators described in the regional language to the respondents the prevalence rates. For example, the respondents were informed that from every thousand persons of Khrew there are 74 people having bronchitis and similarly prevalence rates were described for other areas. The respondents were told to state where do you think is the prevalence of disease highest and lowest. The responses for this question were treated as the eligibility for the inclusion in the analysis. That is, only those respondents/questionnaires were included in the analysis that reported the correct answers or passed risk-communication test. We found only five rejections who could not comprehend the probabilities therefore were excluded from the further analysis.

The second part of the questionnaire was devoted to the valuation questions describing the hypothetical market, payment elicitation methods, bids, respondents WTP and follow up questions. Given the objective of testing the scale/scope effect of CVM, we described two scenarios to the respondents which differed in terms of magnitude of risk reduction. Using split sampling technique, half of the sample was randomly offered 3% while the other half was offered the 1% reduction of risk of chronic bronchitis from the prevailing rate of prevalence (i.e. 8%). In CV surveys hypothetical market need to be created. To elicit peoples WTP for risk reduction mostly researchers use WTP for vaccines, medicines, treatment, automobile safety equipments etc. aiming to reduce health risks (Viscusi *et al*. 1991, Guo *et al*.

2006, Hammitt and Zhou 2006). We used “treatment” as proxy good in the WTP question for risk reduction of Chronic Bronchitis. Respondents were informed about the treatment that would be offered by government at the local Primary Health Unit, and taking part in the treatment will reduce the risk of developing Chronic Bronchitis but people were supposed to pay for the treatment. This preventive treatment provision at public hospital with payments is considered to be familiar to the respondents and reduces hypothetical bias as in the case area various medical services are provided free of cost by the government like physician services and people generally pay for medicines, diagnostic tests etc. The bids values offered as the price of the treatment were designed and takes the value of Rs. 10, 50, 100, 200, 500, and 1000. The bids were randomly offered to the respondents in both the sub-samples (3% and 1%). The WTP responses were elicited using single-bound dichotomous choice format as it minimizes the biases and is incentive compatible (Hanemann *et al*., 1991, Arrow *et al*., 1993 and Carson 2007). Each respondent was asked whether she would purchase the treatment offering stated risk reduction at a specified price (Bid).

The WTP question was stated as: “The risk of developing Chronic Bronchitis among the adult residents of Khrew is 8% (i.e. 8/100). Assume that a onetime preventive treatment programme is being provided at PHC Khrew that would reduce the risk of developing Chronic Bronchitis among the participants. The treatment has no side effects but participants will have to pay for it and is meant for adults only. The preventive treatment among the adult participants will reduce the risk of developing CB from 8% to 5% [or 7%] or equivalently from 8/100 to 5/100 [7/100] that is a reduction of 3 % or 3/100 [1% or 1/100]. Alternatively, it means that in Khrew among 400 adult people CB had developed, if all adult persons will take in this preventive treatment there will be 150 [50] cases of CB less in Khrew. If the cost of the treatment is Rs. ‘X’ [10, 50,100,200,500 or 1000], would you like to pay and participate in the preventive treatment?” Yes / No For the stated WTP question, the responses were elicited in binary yes/no form and the bids and risk magnitude (3% and 1%) were offered randomly to the respondents. The respondents were also asked to state open-ended maximum amount they are WTP for the offered risk magnitude reduction. Some follow-up questions were also put to identify scenario protests/rejections and to distinguish them from real zero payments.

For example, the respondents who declined to participate in the treatment at the offered bid were asked, why they do not want to pay and participate (reason), whether they would like to participate if the treatment is provided free of cost etc. The third section of the CV questionnaire was confined to socio-economic, demographic and other personal and household specific characteristics, like age, sex, education, smoking habits, household monthly income, household size, health rank etc. Before the field survey, a focus group discussions and a pilot survey was carried out to test the feasibility of CV questionnaire and few question were reframed after discussions and the analysis of pilot study.

Sampling and Data Collection: The CV survey respondents are adults (18 years and above). Two hundred and ten adult individuals from Khrew town were selected with one individual from each household for the survey using random sampling. The list of households (along with details of members) was provided by the Notified Area Committee (NAC) Khrew who had conducted a census survey during 2007 for administrative purpose. Out of 1078 households of the town first 210 households were selected randomly. Locating the selected households was not difficult as the town is small having six wards with 100-250 households in each ward. From the identified household’s, one representative adult household member (aged greater than or equal to 18years) was selected for the interview. The data were collected using questionnaires and face to face interviews were conducted with the randomly selected adult persons. The survey was conducted during May 2010 and preferably on Sundays to locate representative household members which usually on other working days are not always available at their residence. All invigilators were research scholars well versed with data collection process and familiar with the regional language who communicated the questions to the respondents for making them easy and understandable.

Methods for Analyzing CV Survey Data: As the value eliciting technique for this CV study is a single-bounded dichotomous choice method in which discrete responses or qualitative values of ‘yes’ or ‘no’ type of answers are available for the WTP question. The econometric methods for the analysis of such data are logit or probit methods. These limited dependent Models are used when the dependent variable takes a qualitative discrete choice among a set of alternatives. We employed a ‘Binary Logistic Regression Model’ with linear bids for the analysis of WTP for the preventive treatment that reduces the offered risk of developing CB. To explain the behaviour of a dichotomous dependent variable we chose a suitable cumulative distribution function (CDF). The probability that a respondent would say ‘yes’ (P_i) to pay a specific Bid amount (in Rupees) for the proposed preventive treatment that would reduce the (offered) risk of developing CB can be explained by:

$$Pi = F\eta\,(\Delta V) = \frac{1}{\{1 + \exp(-\Delta V)\}} = \frac{1}{\{1 + \exp(-(\alpha + \beta_1 B + \beta_2 R + \beta_3 S + e))\}}$$

Where, P_i is the probability of answer ‘yes’ from a respondent, $F_{\eta}(.)$ is the Cumulative Distribution Function (CDF) of a standard logistic variate, ‘B’ represents the ‘bid’ amount, ‘R’ is the magnitude of risk and ‘S’ is a vector of other socio-economic and personal characteristics. α, β_1, β_2, β_3 are unknown coefficients to be estimated. It is expected that with the increase in bid amount ‘B’, the probability of saying yes (P_i) will be less or $\beta_1 \leq 0$. It means higher the bid value lesser is the probability of saying ‘yes’ by the respondent. The sign of the co-efficient of risk reduction variable ‘R’ is expected to be positive. Higher levels of risk reduction are expected to enhance respondent’s willingness to pay for the proposed treatment. Signs of coefficients of ‘S’ will depend on the exact variable and generally differs from context to context. For example for income, age, education, it is expected to be positive; for the number of family members the sign of the coefficient can be either positive or negative. The logit Model is estimated employing ‘Maximum Likelihood Estimation Method’ and using STATA 12.0. To calculate the mean WTP, we used the formula suggested by Hanemann (1989)

$$MWTP = \{\ln(1 + \exp(\alpha))\} / -(\beta)$$

Where, α represents estimated logit regression constant; β represents the estimated coefficient of bid amount. From the estimated mean WTP, the Value of Statistical Case of Chronic Bronchitis (VSCB) can be found by dividing the mean WTP estimate by the risk reduction magnitude i.e. VSCB = WTP/Δ Risk. Whereas change in the magnitude of risk (Δ Risk) is the average of 3% and 1 % that is 2% or 0.02. Out of 210 respondents/questionnaires only 191 were included in the analysis after screening out the incomplete questionnaires, scenario rejection/protest bids and the questionnaires of respondents who could not qualify the risk communication test. Out of 210 questionnaires, 6 were incomplete, 9 rejected the scenario/protests and 5 failed to qualify the risk test. The variables and descriptive statistics based on the 191 respondents are shown in Table No.1 and are discussed below:

P(Yes): The probability of yes [P(Yes)] is a dummy (dependent) variable that represents the response to WTP question attaining the value of '1' for Yes, and zero for 'No'. About 80% of the respondents are WTP the offered bids for specified risk reduction.

Table 1. Descriptive Statistics of Variables- CVM

Variables	N	Mean	Std. Dev.	Min	Max
P(Yes)	191	0.795	0.4041	0	1
BID VALUE	191	292.3	339.56	10	1000
HIGH RISK (3%=1)	191	0.507	0.5012	0	1
AGE	191	39.18	15.291	18	80
SEX (Male=1)	191	0.696	0.4610	0	1
EDUCATION (Years)	191	6.921	5.918	0	18
NOFM	191	7.141	3.483	2	30
SMOKER (=1)	191	0.439	0.497	0	1
HHMY (Rs. Thousands)	191	8.476	7.263	1	35
HEALTH STATUS (Poor=1)	191	0.162	0.369	0	1

Source: Primary Survey, 2010. N = Number of Observations

***Bid value**:* Bid Value represents the randomly offered bids (in Rupees) as cost of treatment. It is a continuous variable and takes six values, Rs. (10, 50, 100, 200, 500, and 1000). The mean bid value was Rs. 339.56.

High risk: High Risk represents the risk reduction magnitude. It is a dummy variable that attains the value of 1, if the respondent was offered 3% risk reduction and takes the value of zero for risk reduction of 1%. The mean value of 0.507 represents that half (50.7%) of the sample was offered 3% risk reduction and other half with 1%.

Age: Age is a continuous variable representing the age of adult respondents in years (above 18 years). The mean value of age was 39.18 years.

Sex: Sex is a dummy variable which attains the value of one if the respondent was male and Zero otherwise. The mean value of 0.696 reveals that 69.6% of the sample respondents are male. The oversampling of males as reflected was because of the complex nature of the good being valued. The sample was biased with over-representation of persons with economic and decision making powers in the household.

Education: Education is a continuous variable representing number of schooling years completed. The average number of schooling years was 6.92 years.

NOFM: Number of family Members (NOFM) represents the size of family. The average family size works out to be 7.14 members.

Smoker: Smoker is a dummy variable which takes the value of '1' if the respondent was a smoker, otherwise Zero. The mean value (0.43) showed that 43% of the adult respondents are smokers.

HHMY: Household Monthly Income (HHMY) is a continuous variable representing household income in Rs. (in thousands). The mean HHMY (8.476) turns out to be rupees eight thousand four hundred and seventy six per household.

Health status: The Self Reported Health Status was a dummy variable representing the general health stock of the respondent. It takes the value of '1' if respondents' rates his/her health as Poor and zero otherwise. Sixteen percent of the respondents rate their health status as poor. Apart from above mentioned variables used in the Logistic Regression for estimating the WTP for risk reduction of CB, the data on prevalence of CB related symptoms among the respondents were also collected and are reported in Table No. 2. As all questions were of 'binary' form with one representing 'Yes' and zero for 'No', the mean values multiplied by hundred showed the percentage of Yes, i.e. Prevalence Rate. The prevalence of respiratory symptoms among the adult respondents of Khrew was quite high. For example Cough with Phlegm for more than three weeks in the past year was reported by 27.22 % of the respondents. Three months Cough with Phlegm in the past year was reported by 18.32%. The CB cases identified on the basis of 'prevalence of Cough and Phlegm for three months in a year and consecutively for two or more years was reported by 10.47%. The prevalence of CB was high among the respondents. Almost all (98%) the respondents attributed the causes of high risk of CB with the presence of cement plants.

Table 2. Chronic Symptoms of Respondents

Variable	Mean
Usual Cough During Days and Nights	0.6230
Usual Phlegm During Days and Nights	0.5863
Cough And Phlegm More Than Three Weeks in Past Year	0.2722
Three Months Cough in Past Year	0.1832
Three Months Phlegm in Past Year	0.1832
Cough and Phlegm at least for Three Months in a Year and Repeatedly for Two or More Years	0.1047
Coughed up Blood	0.1518
Experienced Shortness of Breath in Past Year	0.3246
Experienced Wheezing in Past Year	0.2931
Both Shortness of Breath and Wheezing in Past Year	0.1937

Source: Primary Survey, 2010.

RESULTS AND DISCUSSION

Estimated Results from Binary Logistic Regression Model: Binary Logistic Regression Model was used to check the consistency of WTP responses and to estimate mean WTP for the risk reduction of CB. The Logit Model employing Pseudo-Maximum Likelihood Estimation Technique was estimated using STATA 12.0. The Pseudo-Maximum Likelihood Estimation Technique was employed to take care of heteroskedasticity and, therefore, robust standard errors are reported. The estimated output is shown in Table No. 3. The theoretically expected sign of bid values with respect to the WTP was negative and same has been revealed in the Model. The coefficient of the Bid Value was negative and significant at 1% level. It showed that with the increase in the bid price the WTP declines. The relation reveals the nature of inverse demand curve of the treatment that reduces the risk of CB. The probability of acceptance of the offered bids for two risk reduction scenarios (3% and 1%) and combined acceptance was shown below in figures. As shown in Fig. a, among the respondents offered with 1% risk reduction, the probability of accepting the bids decreases with the increase in the bid value. However, in Fig. b, among the respondents offered with 3% risk reduction the bid value of Rs. 100 and Rs. 500 showed peaks which may be ascribed to the small sample size but the combined bid acceptance as shown in the Fig.c was again in line with the theory. Though small bid values have high (100%) acceptance level but the highest bid value has almost 50% acceptance level. The coefficient of 'High Risk' measures the Likelihood of incremental WTP for a 3% (rather than 1%) reduction in the probability of developing CB. *The sign of the coefficient was positive as expected and suggests high risk reduction magnitude (3%) increases the Likelihood of WTP but the relationship was not significant.* The statistical insignificance suggests that respondents are insensitive to the stated magnitude of risk reductions. The insensitivity of WTP to the magnitude of health risk reduction has been reported in various studies (Hammitt and Zhou 2006; Gou *et al*. 2006). The possible reason for the insensitivity of WTP to risk reduction magnitude may be the difficulty in evaluating the small probabilities (Hammit and Graham 1999).

Among other control variables, the coefficients of age and sex are positive showing that elderly and male persons are more likely to pay for the offered risk reduction but the association was not statistically significant in both the variables. The educated people may have understanding of risk probabilities, health investment/treatment capabilities. Therefore, WTP was assumed to increase with the increase in education and same has been revealed in the study. The positive coefficient of education was statistically significant at 10% level. Number of family members (NOFM) was expected to have negative sign as more number of household members reduces the capacity to spend and was more pronounced among the households with high dependency rates. The NOFM has negative expected sign but the relationship was not significant. The coefficient of SMOKER was estimated as positive showing that smokers are more likely to pay for the risk reductions than no-smokers. Smoking has been associated with increase in the prevalence of CB; therefore, smokers tend to be more familiar with the disease and hence are willing to pay more but the association was not statistically significant. Positive but insignificant relationship between current smokers and WTP was also reported by Hammitt and Zhou (2006) in the context of China. The coefficient of household monthly income (HHMY) was positive as expected showing that the likelihood of WTP increases with the increase in income. The coefficient was significant at 10% level.

The relationship was in consonance with the findings of Hammitt and Zhou (2006). The self-reported poor health status was positively associated with the probability of saying yes to the WTP question but the coefficient was not statistically significant. In the rural areas of China, Hammitt and Zhou (2006) also showed the positive but insignificant association between poor health status and WTP. Table No. 3 also reports the overall Model significance and goodness of fit. The Pseudo-Loglikelihood was -77.0012, and Wald Chi*2* (9) was 26.77 with P-value less than 0.01 which showed that Model was significant at 1% level. The Pseudo R^2 was 0.2035 which is reasonable for cross sectional data. *Hence the overall predictability of the Model is satisfactory. Willingness to Pay (MWTP) and Value of Statistical Case of Chronic Bronchitis (VSCB:* From the estimated output of logistic regression the mean WTP was calculated using Hanemann's (1989) formula [$MWTP = \{ln(1+ exp(\alpha)\}/ -(\beta)$], and it turns out to be Rs. 360.80. The estimated value of Statistical Case of Chronic Bronchitis which is the ratio of mean WTP and mean risk reduction was Rs. 18040. [VSCB = MWTP/Δ Risk. Taking average of risk (3% +1%= 2 % or 2/100) the VSCB = Rs. 360/0.02= Rs. 18040. The estimated VSCB was very low in comparison to the estimated results of other studies of developed countries. In Viscusi *et al*. (1991) it was $457000, but a similar study by Hammitt and Zhou (2006) reported median VSCB ranging from $500 -$1000 and mean VSCB from $1500-$3000 at the three locations in China. Our estimates are low but comparable to Hammitt and Zhous' (2006) estimates. The difference in estimates may be due to the large differences in the incomes between the countries as the WTP estimates are sensitive to income. Even though in monetary terms the value was not quite high, but given the acceptance rate of the hypothetical preventive treatment was more than 80% suggests that interventions are highly desired and demanded in this case area.

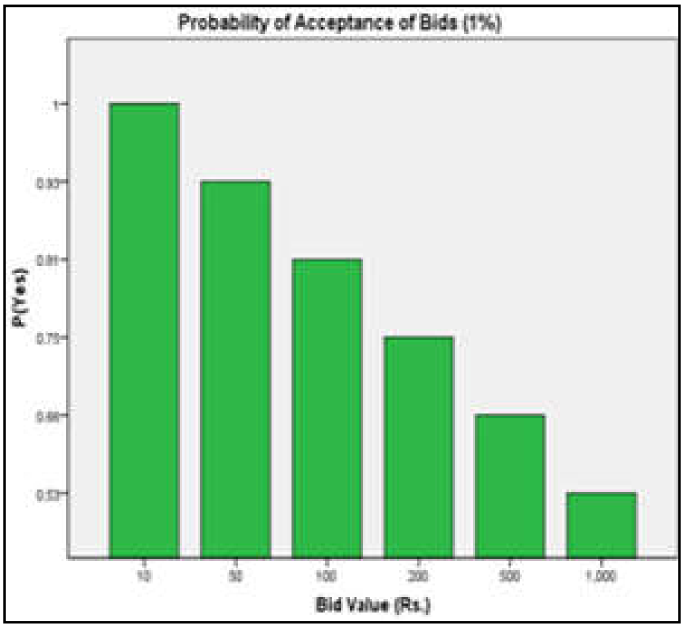

Fig. a.

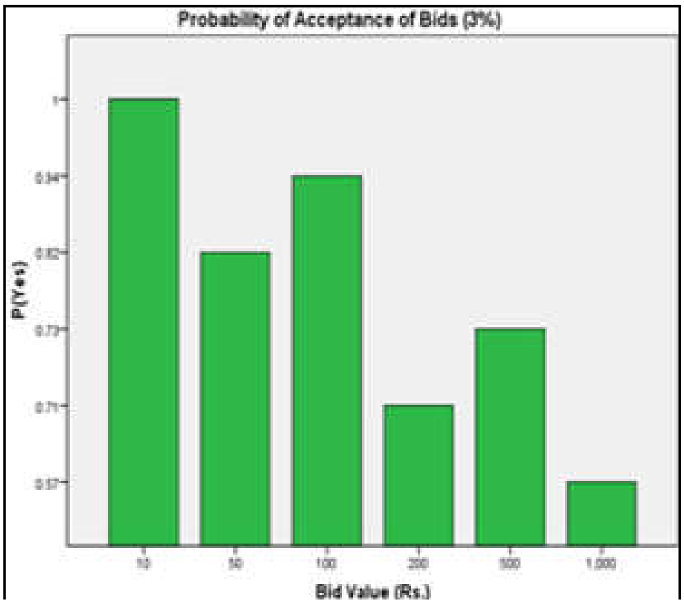

Fig. b.

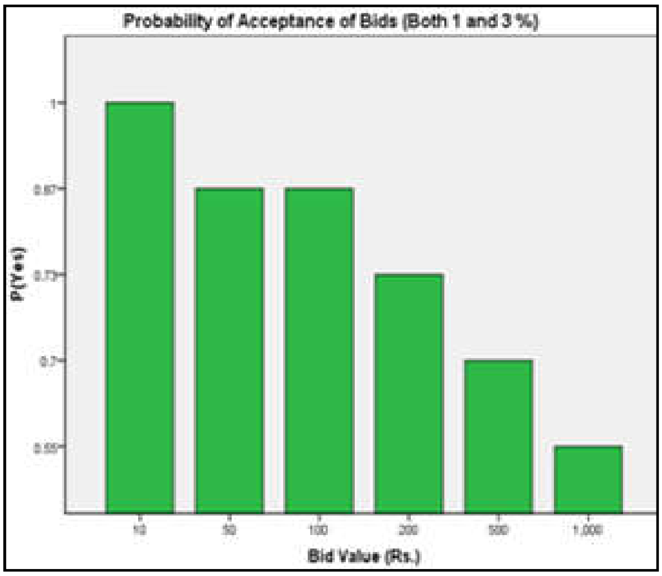

Fig. c

Table No. 3. Logit Model Estimates from CV Survey

Dependent Variable: P(Yes) for WTP			
Variables	Coefficient	Std. Err.	P>|z|
BID VALUE	-0.00280	0.000621	0.000***
HIGH RISK	0.66941	0.43536	0.124
AGE	0.00541	0.013831	0.696
SEX	0.52218	0.455035	0.251
EDUCATION	0.08600	0.046409	0.064* *
NOFM	-0.06390	0.050385	0.205
SMOKER	0.29193	0.525572	0.579
HHMY	0.06921	0.035238	0.05**
HEALTH STATUS	1.61985	0.669502	0.016**
Constant	0.55756	0.76813	0.468
Log Pseudolikelihood	-77.0012		
Wald chi2(9)	26.77		
Prob > chi2	0.0015		
Pseudo R^2	0.2035		
Number of obs	191		

Note: *, **,*** represents significant at 10%, 5% and 1% level respectively.

Conclusion

For valuing chronic bronchitis risk reduction, the WTP was statistically insignificant to the magnitude of risk reduction. However, the sign was positive. The MWTP was estimated to be Rs. 360 and the Value of Statistical Case of Chronic Bronchitis turns out to be Rs. 18040. WTP decreases with bid price but increases with education, income and poor health status. Despite the limitations, the study provided WTP based estimates of Chronic Bronchitis for monetary valuation of environmental health policies. Environmental-health related Valuation studies are scarce in developing countries. Hence every addition will indeed facilitate environmental accounting. Advanced and rich methodological designs of stated preference methods need to be tested in the Indian context. Research on Contingent Valuation Techniques and emerging Experimental Designs will be key area of interest particularly in the context of Environmental Health.

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