DIMINISHING MARGINAL WILLINGNESS TO PAY FOR HEALTH BENEFIT: INTERNAL AND EXTERNAL TESTS OF SCOPE

Raymond YT Yeung, Research Assistant Professor[1,2]
Richard D Smith, Senior Lecturer[3] and Honorary Associate Professor[1]
Wong Lai-chin, Senior Research Assistant[1]
June Chau, Research Assistant[1]
*Sarah M. McGhee, Associate Professor[1,2]

Affiliation:
[1]Department of Community Medicine, Faculty of Medicine, University of Hong Kong
[2]Medical and Health Research Network, The University of Hong Kong
[3]Health Economics, Law and Ethics Group, School of Medicine, Health Policy and Practice, University of East Anglia

*Corresponding author:
Dr Sarah M McGhee, Department of Community Medicine, The University of Hong Kong, 5/F, Academic & Administration Block, 21 Sassoon Road, Pokfulam, Hong Kong
Tel: (852) 2819 9193; Fax: (852) 2855 9528
Email: smmcghee@hkucc.hku.hk

This version: 31 May 2002
Word count: 3528

Acknowledgements
This study was financially supported by the Health Care & Promotion Fund of the Hong Kong Government. The authors are indebted to Stale Navrud for helpful comments. All errors and omissions are the sole responsibility of the authors.

Abstract

Willingness-to-pay (WTP) is increasingly being used to value health benefits. One theoretical prediction concerning WTP is that values should be dependent upon the size of benefit being valued, such that, *ceterus paribus*, respondents will be willing to pay more for a greater than a lesser benefit: usually referred to as 'sensitivity of scope'. Empirically, studies often test for this property to establish the 'construct validity' of the WTP values obtained – that the values show a positive correlation with the size of benefit.

However, studies usually rely *either* upon 'external' (between-sample) or 'internal' (within-sample) testing for sensitivity of scope. For the former, one cannot rule out the possible influence upon the results that unobserved heterogeneity between samples may have, and for the latter bias is introduced as respondents recall their WTP for previous questions when providing subsequent values.

This study therefore presents an *integrated* model developed to perform *both* internal *and* external tests for sensitivity of scope. This model is then applied to empirical data from a WTP survey conducted in Hong Kong to estimate the value of reducing (1, 3 and 7) days of symptoms associated with air pollution. The results indicate that although WTP is sensitive to scope, this is at a diminishing, rather than constant, marginal rate. Although this is encouraging as it follows theoretical predictions, it casts doubt on the validity of extrapolation of WTP values from one context (in this case, duration of symptoms) to another, which some studies have undertaken, and provides further support of WTP values being highly context-specific.

Keywords: health, willingness to pay, contingent valuation, morbidity, air pollution

1. Introduction

The valuation of health benefits in monetary terms, through assessing individual willingness-to-pay (WTP), has become increasingly popular over the last decade [1-3]. Although many studies do not incorporate tests for the validity or reliability of the WTP values obtained, those that do often test for *construct validity*: the degree to which the results accord with underlying economic theory [1, 2]. One key aspect in assessing construct validity is the sensitivity of WTP values to the scope of the benefit: that, *ceterus paribus*, WTP increases as the size of the benefit increases. However, there are two issues arising from this: (i) whether such a relationship holds empirically; and (ii) if so, does it hold at a constant or variable rate?

With respect to the first issue, it has been demonstrated in several studies in the environmental literature that WTP values do not necessarily vary with the scale of the commodity being valued; a phenomena known as 'embedding'. For example, it has been found that the WTP for the prevention of decline in fish populations in the whole of Ontario, Canada, was found to be virtually identical to the WTP for the same measures in lakes within a small area of Ontario [4]. Similarly, another study found no significant difference in WTP to save 2,000, 20,000 and 200,000 waterfowl from dying [5]. Similar results have also been shown in health care [6]. Such 'embedding' must be taken into account when considering the validity of WTP surveys.

There have been a number of reasons postulated to explain such embedding. For example, that respondents view any intervention or benefit as 'symbolic', and thus referring to the value placed on, for example, 'waterfowl' *per se* regardless of the actual number of birds [7]. Another explanation could be that individuals, in providing their WTP values, refer to 'mental accounts' concerning *groups* of commodities, rather than *individual* commodities [8]. For example, instead of allocating a set amount to attending opera, another for cinema and another for theatre, an individual may allocate one figure to ‘entertainment’ and distribute it differently at different times between these three different possible claims on that ‘entertainment’ account.

With respect to the second issue about the rate of change of WTP, there are two competing interpretations. First, according to the law of diminishing marginal utility, one would predict that the value of a benefit will increase as its size increases, but at a diminishing rate [9]. However, it is not clear if this rate of diminution is affected by the relative size of the initial benefit or the subsequent size of the ‘marginal’ change. Thus, it may be that there is little diminution in benefit *per unit* of benefit if these units are small, but this may be reversed as the individual unit size of benefit increases [10]. Alternatively, the level of utility derived from each unit of benefit could remain constant, but WTP be seen to increase at a diminishing rate due to greater imposition of the income constraint. Most importantly, if WTP is seen not to increase at a constant rate, doubt is cast upon the validity of extrapolating the WTP values from one context (size of benefit) to another.

However, although these issues have been considered and tested for in environmental economics, there have been few studies in health [11, 6, 12]. Studies within health have relied upon *either* ‘external’ (between-sample) or ‘internal’ (within-sample) testing for sensitivity of scope. For the former, one cannot rule out the possible influence from unobserved heterogeneity between samples, and for the latter ‘bias’ may be introduced as respondents recall their WTP for previous questions when providing subsequent values [13]. Further, such studies are usually concerned only with testing for the presence of sensitivity to scope *per se*, than whether it is at a diminishing or constant rate. To the author’s knowledge, no previous study has incorporated theoretical expectation explicitly into the test procedures.

This paper therefore seeks to consider both these issues through the development and application of an *integrated* model to perform both internal *and* external tests for sensitivity of scope. Empirical data from a WTP survey conducted in Hong Kong to estimate the value of reducing the duration of symptoms associated with air pollution is then fitted to an econometric model.

Following this introduction, section 2 outlines briefly the empirical WTP study, and section 3 then presents the econometric model developed to test for sensitivity to scope. Section 4 presents the results of the application of this model to the empirical data, and section 5 concludes with a discussion of the implications of these findings.

2. The WTP Survey

A contingent valuation (CV) survey was administered to a representative sample of adults in Hong Kong between November and December 2001. The survey was administered by telephone interview in the local language (Cantonese). Sample selection was based on random digit dialing to select a respondent within a household, followed by repeated calls (up to 10 times) until the targeted respondent was reached.

The questionnaire used was based on one carefully tested and used by the US Environmental Protection Agency for valuing the effects of air pollution, and which included examination of some minor symptoms [10]. The survey reported in this paper obtained WTP values for the reduction in days of symptoms coughing, shortness of breath and congested throat across two sub-samples.

Sub-sample A provided WTP values for reduction in all three symptoms (coughing, shortness of breath and congested throat). To reduce the length of the questionnaire, sub-sample B provided WTP values to reduce coughing only. Coughing was selected because it was the most easily understood symptom in the pilot study. In each sub-sample, the respondent was asked whether he or she had experienced the specific symptom, to the stated degree of severity, during the past year. For example, for coughing, the question was:

> *"During the past year, have you coughed 4 or 5 times within one hour; each cough lasts for 5 to 20 seconds; to the extent that your chest can feel it but that does not obstruct your daily activity (back translated from the Chinese version) – Answer: Yes / No/ Similar-but less severe"*

This provided both background information and, importantly, ensured that respondents were all valuing the same good (symptom and severity). Sub-sample A respondents were also asked to rank the severity of each symptom relative to the other symptoms to allow a 'construct' validity check: that, *ceterus paribus*, WTP should be positively correlated with the ranking of the symptom, where a rank of one equates to least desirable. Respondents in both sub-samples were then presented with an open-ended WTP question, in local language (Cantonese), for each of the three symptoms, taking the form:

> *"Assume that money can help you to avoid the symptom and you can pay for it from your own pocket, that is, you will have less to spend on other goods or services. Please take a moment to think about the pain and suffering caused by the symptom and the medical expense you will spend to relieve the symptom." (a 5 second break) "Now assume that you would experience one day of such coughing tomorrow, how much is the maximum amount you are willing to pay to avoid one day of this symptom?"*

Respondents were therefore reminded that the payment would be out of their own pocket and involved sacrifice of other consumption.

Within each of the two sub-samples, A and B, 50% of respondents were then asked the same question, but with the benefit increased from one to three days of the symptom episode (sub-sample III), and 50% asked the questions with the benefit increased from one to seven days of the symptom episodes (sub-sample VII). Thus, WTP values were obtained from sub-sample AIII for avoidance of 1-day and 3-day episodes of coughing, shortness of breath and congested throat, from sub-sample AVII for avoiding 1-day and 7-day episodes of the three symptoms, from sub-sample BIII for 1-day and 3-day avoidance of coughing, and from sub-sample BVII for avoiding 1-day and 7-day episodes of coughing.

For sub-sample B (N = 88, 62% of total sample), a series of 'challenging' questions were asked to maximise the reliability of the answers provided by the respondents. The respondent was first asked to state their degree of confirmation of the WTP values provided, on a 5-point scale ranging from 'Very sure' to 'Very unsure'. For the 1-day question, the respondent was asked to state whether they had considered their ability to pay, and pain and suffering when answering the previous WTP question. For the 3- and 7-day questions, respondents were asked an open-ended question of how they computed their WTP values. At the end of these questions respondents were allowed to revise their stated WTP if they desired. Demographic data of the respondents were collected.

3. Model for assessing sensitivity of scope

For a CV study to provide a valid valuation of health benefit the estimated WTP should be sensitive to the scale of benefit being valued. Two hypotheses concerning the sensitivity of

WTP values to size of health benefit are tested for in this paper.

First, that WTP to avoid minor morbidity is positively correlated with the duration of the symptom episode. That is, WTP to avoid the 3-day episode should be at least as large as that for the 1-day episode, and, similarly, the WTP to avoid the 7-day episode should be at least as large as that for the 3-day episode. The null hypothesis is that WTP is insensitive to symptom duration.

Second, that WTP values increase at a decreasing rate. That is, WTP to avoid the 3-day (7-day) episode should be less than three-times (seven-times) the WTP to avoid the 1-day episode. Furthermore, the decreasing rate hypothesis should also imply that the WTP to avoid the 7-day episode should be smaller than 7/3 times the WTP to avoid the 3-day episode. The null hypothesis is that WTP is linearly proportional to the scale of benefit (i.e. constant marginal utility).

Diminishing marginal WTP can therefore be examined by a joint hypothesis. From the study outlined in section 2, the hypothesis of diminishing WTP can be examined *internally* between the multiple-day episode and the single-day episode within a subject, and examined *externally* between the ratio of two multiple-day episodes between two samples. This study therefore presents an *integrated* model developed to perform *both* internal and external tests for sensitivity of benefit duration. The model, presented below, examines the magnitude of WTP (or log WTP) estimates, imposing restrictions according to *a priori* expectation.

Suppose WTP for avoiding a 3 or 7-days episode is γ -folded of that of a single day duration. The multiplier can be computed by estimating the ratio of WTP values. To capture heterogeneity among respondents, the ratio can be expressed as

$$\left(\frac{WTP_d}{WTP_1}\right)_i = \gamma * \exp(X_i\beta + \varepsilon_i) \qquad (1)$$

$$\varepsilon_i \sim iid(0, \sigma)$$

where d is the duration of symptom episode, γ = d if the constant utility hypothesis holds, and $X_i\beta$ and ε_i are the observed and unobserved heterogeneity among individuals. If $X_i\beta + \varepsilon_i = 0$, then the ratio of WTP is thus simply the theoretical γ. This specification also ensures that $\exp(X_i\beta + \varepsilon_i) \geq 0$. To avoid a negative value of WTP, a natural log-transformation of the WTP ratio is taken, and thus equation (1) can be expressed as:

$$\ln\left(\frac{WTP_d}{WTP_1}\right)_i = \ln\gamma + X_i\beta + \varepsilon_i \qquad (2)$$

In the study presented in this paper, pair-wise data is provided of (WTP_3, WTP_1) and (WTP_7, WTP_1). Under the null hypothesis that γ equals the number of days, the data set can therefore be stacked as

$$\ln(RWTP_i) = \begin{bmatrix} \ln(WTP_3 / WTP_1)_i \\ \ln(WTP_7 / WTP_1)_i \end{bmatrix} = \begin{bmatrix} \ln 3 \\ \ln 7 \end{bmatrix} + + \begin{bmatrix} X_i \\ X_i \end{bmatrix}\beta + \begin{bmatrix} \varepsilon_i \\ \varepsilon_i \end{bmatrix} \qquad (3)$$

where $RWTP_i$ refers to the ratio of WTP, or simply

$$\ln(RWTP_i) = \alpha + \rho \cdot D_7 + X_i\beta + \varepsilon_i \qquad (4)$$

so that if γ = d, α = ln(3) = 1.098 and ρ = ln(7) – ln(3) = 0.85. γ is expected to be greater than zero if the WTP values are to pass an internal scope test. Likewise, a non-zero ρ will satisfy the external criterion after controlling for individual heterogeneity between samples.

4. Results

4.1 Sample characteristics

Of the 848 telephone numbers dialed, 329 were invalid numbers and 334 of the targeted individuals were not at home. Only 43 individuals contacted refused to participate in the survey. Overall, 142 subjects completed the interview and 140 answered all WTP questions, giving an 'effective' response rate of 76%. Three respondents stated WTP values larger than their reported personal income, and were thus excluded from analysis. Of the remaining 137 cases, 28 were in sub-sample AIII, 24 in AVII, 46 in BIII and 39 in BVII. The demographic characteristics of the population, split between sub-samples III and VII, are provided in table 1.

There are some variations between these two sub-samples in terms of demographic statistics. While mean age, education level and proportion of men are similar, the proportion of those who are single is higher for sample VII. This group also has lower income than sample III, highlighting the need to control for sample heterogeneity in subsequent analysis of sensitivity of scope.

4.2 Reliability checking

As table 2 indicates, 94% of sub-sample B had thought about their ability to pay and, 88% about the inconvenience, the pain and the suffering related to coughing when stating their WTP, while more than two-thirds of respondents were 'sure' or 'very sure' about their stated WTP. These results provide direct support for the validity of the WTP data. The problem of 'protest' zero responses are not detected in this study [14]; only two subjects reported zero

WTP. More than 50% of respondents stated that the value of consecutive days of pain and suffering through coughing was greater than multiple days of the symptom.

4.3 WTP for avoidance of symptom episode

Table 3 summarizes the median and mean WTP for the avoidance of coughing, shortness of breath and congested throat across the whole sample. For 1-day episodes of these symptoms, the median (mean) WTP values range from HK$50 (HK$105) for a congested throat to HK$150 (HK$198) for shortness of breath [HK$7.8 = US$1]. The corresponding values for three and seven days (denoted WTP_3 and WTP_7) are all multiples of the one-day figures, although there appears to be a non-linear relationship between WTP and symptom duration. While the mean WTP value for three days (WTP_3) across all three symptoms appears to be approximately triple the one-day value (WTP_1), the mean WTP for seven days (WTP_7) across all three symptoms is only around five- to six-times the one-day figure. A similar pattern occurs in the median statistics, although not quite so closely, and with a preference reversal revealed in the median value for a congested throat.

Application of a skewness-kurtosis test [15] rejected the null hypothesis that raw WTP follows normality (all p-value < 0.05) for WTP_1, WTP_3 and WTP_7 of all symptoms. Thus, log-transformation of the data was undertaken, resulting in non-rejection of the null hypothesis that WTP_1 of shortness of breath, WTP_3 of coughing and shortness of breath, and WTP_7 of all symptoms are normally distributed, at the 5% level.

One would expect WTP_3 to be smaller than WTP_7 if the study population is sensitive to scope: in this instance, duration. For this, a crude external scope test on the transformed values may be performed to test for any significant difference between the mean values of $\ln WTP_3$ and

$\ln WTP_7$ across the two sub-samples. For coughing, a two-sample t-test (one-sided) supports the alternative hypothesis that mean $\ln WTP_3$ minus mean $\ln WTP_7$ is smaller than 0 at 5% level (p-value = 0.01). Probably because of the smaller sample size, the results do not hold for symptoms of shortness of breath (p-value = 0.20) and congested throat (p-value = 0.09).

However, an alternative explanation for this observed difference across 3- and 7-day WTP values is that the two sub-samples are not homogeneous in terms of how they value health. A crude way of testing this is to perform between-sample t-tests comparing $\ln WTP_1$ of the two sub-samples, which here finds that the null hypothesis that mean $\ln WTP_1$ is statistically different for all three symptoms cannot be rejected (coughing p-value = 0.668; shortness of breath p-value = 0.062; congested throat p-value = 0.481). Thus, the two sub-samples value the benefits to a similar extent. In terms of WTP valuation we cannot regard them as heterogeneous. Since mean $\ln WTP_3$ is significantly different from mean $\ln WTP_7$ for coughing, the crude external scope test provides evidence supportive to the hypothesis that the WTP values are positively correlated with the duration of the symptom.

4.4 The hypothesis of diminishing WTP

The crude external tests above provide mixed results about sensitivity of scope. In particular, the external test might have ignored heterogeneity across sub-samples. However, since respondents provided both their WTP for 3- and 7-day, as well as for 1-day, reduction of symptoms, internal sensitivity tests may be performed.

Although the simplest means to do this is to regress WTP_3 on WTP_1 and test whether the coefficients of WTP_1 are different from zero, this is limited because it ignores the availability of the WTP_7 data. Thus, the information provided from both within- and between-samples is embedded by using the econometric model described earlier. This not only provides data on the sensitivity of WTP values to duration, but also specifies the rate of such sensitivity, based on the hypothesis that if WTP_7 / WTP_3 equals 7/3 then this indicates a constant marginal utility profile.

Empirical estimation of the model, using multiple regression analysis, is provided in table 4 which shows two equations: one specifying a simple relationship between WTP_1 and WTP_7, and one which also includes demographic variables.

None of the demographic variables are significant, implying that sample heterogeneity cannot explain the variation of $RWTP_i$. The constant and dummy variable coefficients of the 7-day sub-sample are significantly different from zero in both regressions, indicating that the study population is sensitive to scope.

According to the theoretical model presented earlier, the constant coefficient is predicted to be ln(3) (=1.098), and the sum of the constant and coefficient of D_7 predicted to be ln(7) (=1.95). For both regression models, the estimates of the constant coefficients (1.074 and 1.099) cannot reject the null hypothesis that $\alpha = 1.098$ (p-values = 0.77 and 0.99 respectively). However, the sum of estimated α and estimated ρ are 1.371 and 1.425 in the two regression models. In both models the estimates reject the null hypothesis of constant marginal utility i.e. $\alpha+\rho = 1.95$. This result suggests that respondents' WTP for avoiding symptom diminishes with increasing duration of the episode.

5. Discussion

There are three important indications from this analysis. First, the estimated WTP values derived from this study accord with standard economic theory: that WTP increases at a diminishing rate with increased duration of the benefit. However, this sensitivity to scope was more pronounced for the 1- to 3-day symptom reduction than the 1- to 7-day reduction. In other words, at small levels of expected WTP (compared to income), the impact of diminishing WTP values is larger. We postulate that there is association between sensitive to scope and affordability. This has three implications for CV studies: (i) it may explain why embedding may be a significant factor in some studies and not in others; (ii) it may be a significant difference between the use of CV in environmental and health economics, and thus cast some doubt upon the reliance on guidelines from within the environmental economics field (such as NOAA [16]) in the design of CV studies within health care; and (iii) it may limit the use of scope as a test for construct validity in studies where WTP is a low proportion of income.

Second, the analyses indicate that an integrated model has great power in establishing scope effects in WTP studies than 'crude' internal or external estimates. These 'crude' tests provided only mixed results about sensitivity of scope, whereas the integrated model provided more precise indications of diminishing marginal utility.

Third, the finding of diminishing marginal WTP casts doubt on the (linear) extrapolation of WTP estimates to the valuation of other quantities of benefit. For example, in the valuation of risk literature, the value of statistical life is computed from linear extrapolation of WTP values for a risk reduction to the extent that the value is equal to a risk reduction of 100% (certain death). Thus, one may be tempted, in the case presented here, to project the WTP value for multiple-day symptom episodes from WTP_1. However, results indicate that this linear extrapolation will be valid for small scale extensions (smaller than 3 days) but not larger ones.

However, an important caveat to the analysis is that the model cannot identify the underlying *reason* for the diminishing WTP observed from the survey. There is no mechanism in the CV study to tell whether the diminishing WTP indicates ‘true’ diminishing marginal benefit or increasing impact due to the presence of income constraint. For example, more than 50% of respondents stated that consecutive days of coughing are more severe than several non-consecutive (and distinctive) days. This could have implied *increasing* marginal benefit of consecutive days of avoiding a symptom, leaving the income constraint as the cause of the observed (but not true) diminishing WTP. Further research in this area should focus on the cause of this diminishing function: is it that the marginal utility diminishes or that income constraint becomes increasingly important?

References

1. Olsen JA, Smith RD. Theory versus practice: a review of 'willingness-to-pay' in health and health care. *Health Economics*, 2001; 10:39-52.
2. Smith RD. Construction of the contingent valuation market in health care: a critical assessment. *Health Economics* (in press).
3. Diener A, O'Brien B, Gafni A. Health care contingent valuation studies: a review and classification of the literature. *Health Economics*, 1998; 7:313-26.
4. Cummings RG, Brookshire DS, Schulze WD. *Valuing environmental goods: an assessment of the contingent valuation method*. Totowa, NJ: Rowman and Allanheld, 1986
5. Desvousges WH, Johnson FR, Dunford RW, Boyle KJ, Hudson SP, Wilson KN. Measuring natural resources damages with contingent valuation: tests of validity and reliability. In Hausman JA (ed.) *Contingent Valuation: A Critical Assessment*, North-Holland, Amsterdam, 1993: 91-164.
6. Sheill A, Gold L. Contingent valuation in health care and the persistence of embedding effects without the warm glow. *Journal of Economic Psychology*, 2002; 23: 251-262.
7. Baron J. Biases in the quantitative measurement of values for public decisions. *Psychological Bulletin*, 1997; 122: 72-88.
8. Tversky A, Kahneman D. The framing of decisions and the rationality of choice. *Science*, 1981; 211: 453-458.
9. Varian H. *Microeconomic Analysis*. New York: W.W. Norton and Company, 1992.
10. Tolley G, Kenkel D, Fabian R. *Valuing health for policy: An economic approach.* The University of Chicago Press: Chicago, 1994.
11. Carson RT, Mitchell RC. The issue of scope in contingent valuation studies. *American Journal of Agricultural Economics*, 1993; 75: 1263-1267.
12. Kartman B, Stalhammar NO, Johannesson M. Valuation of health changes with the contingent valuation method: a test of scope and question order effects. *Health Economics*, 1996; 5: 531-41.
13. Cameron TA, Quiggin J. Estimation using contingent valuation data from a ‘dichotomous choice with follow-up’ questionniare. *Journal of Environmental Economics and Management*, 1994; 27: 218-234.
14. Dalmau-Matarrodona E. Alternative approaches to obtain optimal bid values in contingent valuation studies and to model protest zeros. Estimating the determinants of individuals' willingness to pay for home care services in day case surgery. *Health Economics*, 2001; 10: 101-18.
15. D’Agostino RB, Balanger A, D’Agostino Jr. RB. A suggestion for using powerful and informative tests of normality. *The American Statistician*, 1990; 44: 316-321.
16. Arrow K, Solow R, Portney PR, Leamer EE, Radner R, Schuman H. Report of the NOAA panel of contingent valuation. *Federal Register*, 1993; 58: 4601-4614.

Table 1: Sample characteristics

	Full sample	3-days	7-days
N	137	74	63
Age (mean)	42.1	42.4	41.8
Male (%)	40.9%	40.5%	41.3%
Income (mean*)	HK$11,233**	HK$12,694	HK$9,508
High school or below	80.3%	79.7%	81.0%
Married	65.2%	73.6%	55.6%

Note:
*mid-points of interview were used to calculate the sample mean
** HK$7.8 = US$1

Table 2: Direct evidence to support construct reliability

	N = 85
'Considered ability to pay'	94%
'Considered pain & suffering'	88%
'Sure' + 'Very sure about 1 day WTP'	66%
'Sure' + 'Very sure about 3(7) days WTP'	86%
'Do you think pain and suffering of coughing for consecutive days is less / equal / more severe than distinctive days?	Less - 29% Equal – 18% More severe – 53%

Table 3: WTP data collected from the survey

	N	Median (HK$)	Mean (HK$)	Std. Dev.
Coughing				
1 day	137	100	160.5	193
3 days	74	300	509.6	790.4
7 days	63	400	620.2	629.1
Shortness of breath				
1 day	52	150	197.1	275.5
3 days	28	400	607.8	743.1
7 days	24	475	914.3	1174.1
Congested throat				
1 day	52	50	104.9	112.4
3 days	28	200	279.2	257.1
7 days	24	175	549.3	757.9

Table 4 Regression results of constant utility hypothesis

	Regression 1		Regression 2	
Variable	Coefficient	Std. Err.	Coefficient	Std. Err.
Constant	1.074**	0.082	1.099**	0.238
D_7	0.297*	0.121	0.326*	0.128
Male			0.097	0.131
Age			-0.003	0.005
Income ($1000)			0.014	0.008
Above High School			-0.266	0.177
Married			-0.088	0.147
Observations	136		131	
Adjusted R^2	0.036		0.045	

Notes: **, * significant at 1, 5%