MS ritgerð

í heilsuhagfræði

Health-related Quality of Life and Compensating Income Variation for 18 Health Conditions in Iceland

Hanna Björg Henrysdóttir

Leiðbeinendur: Tinna Laufey Ásgeirsdóttir og Þórhildur Ólafsdóttir

Hagfræðideild

Október 2016

HÁSKÓLI ÍSLANDS

Health-related Quality of Life and Compensating Income Variation for 18 Health Conditions in Iceland

Hanna Björg Henrysdóttir

Lokaverkefni til MS -gráðu í hagfræði

Leiðbeinendur: Tinna Laufey Ásgeirsdóttir og Þórhildur Ólafsdóttir

Hagfræðideild

Félagsvísindasvið Háskóla Íslands

Október 2016

Health-related Quality of Life and Compensating Income Variation for 18 Health Conditions in Iceland

Ritgerð þessi er 30 eininga lokaverkefni til MS prófs við Hagfræðideild, Félagsvísindasvið Háskóla Íslands.

Prentun: Háskólaprent ehf.

Reykjavík, 2016

Formáli

Þessi rannsókn er lokaverkefni til meistaragráðu í heilsuhagfræði og vegur 30 ECTS einingar. Leiðbeinendur mínir voru Tinna Laufey Ásgeirsdóttir doktor í heilsuhagfræði og prófessor við Hagfræðideild Háskóla Íslands og Þórhildur Ólafsdóttir doktor í heilsuhagfræði. Ég færi Tinnu Laufeyju og Þórhildi bestu þakkir fyrir góða leiðsögn.

Útdráttur

Erfitt getur verið að meta virði heilsu, en til að hægt sé að taka þjóðhagslega skynsamar ákvarðanir og ráðstafa fé innan heilbrigðskerfisins á sem bestan hátt þarf að liggja fyrir verðmat á heilsu. Algengar aðferðir sem notaðar eru til að verðmeta heilsu eru greiðsluviljaaðferðir sem byggja á beinum athugunum eða ímynduðum aðstæðum þar sem einstaklingur á að meta þá upphæð sem hann er reiðubúinn að greiða til að sleppa við ákveðnar aðstæður. Í þessari rannsókn eru gögn úr könnun um heilsu og líðan Íslendinga frá árunum 2007, 2009 og 2012 notuð til að verðmeta átján heilsukvilla. Tölfræðilegt samband vellíðunar, tekna og heilsukvilla er skoðað og þannig er sneitt framhjá þeim bjaga sem fylgir öðrum aðferðum við að meta greiðsluvilja. Í þessari rannsókn var sem dæmi árlegt virði þess að sleppa við depurð metið á 158.814.000 kr., árlegt virði þess að forðast tíða höfuðverki var metið á 19.435.000 kr., virði þess að sleppa við verulega sjónskerðingu var metið á 14.453.000 og virði þess að sleppa við slæma mánaðarlega tíðaverki var metið á 7.615.000 kr. á ársgrundvelli. Þessi rannsókn veitir yfirsýn yfir virði þess að sleppa við átján mismunandi heilsukvilla og þar sem sömu gögn og sama aðferð er notuð við verðmatið gefa niðurstöðurnar kost á innbyrðis samanburði á því verðmati.

Abstract

Using data from an Icelandic health and well-being survey, carried out in 2007, 2009 and 2012, we estimate the monetary compensation needed to maintain the same level of well-being with and without specific health conditions. Specifically, 18 health problems are evaluated using a compensating income variation (CIV) approach. This approach employs measurements of individuals' well-being using a population sample and with no hypothetical situations involved, thus offering a solution to biases of often used methods to value non-marketed goods. Results from our CIV analyses indicate that 1,301,758 USD are needed per year to compensate for the presence of melancholy, 159,301 USD are needed to compensate for frequent headaches, 118,465 USD are needed per year to compensate for severely low vision and for severe monthly menstrual cramps 62,419 USD per year are needed. This research adds to the CIV literature by providing an interesting starting point for further research employing the CIV method to health and provides important knowledge on the monetary value of several health conditions. Furthermore, since several different health conditions were valued with the same sample and same methodology this research provides a ranking between the conditions, aiding policy makers in prioritizing scarce resources.

Table of contents

List of tables

1 Introduction

Knowledge of the value of health interventions is important for policy makers for efficient allocation of resources within a health-care system. Such estimations require information on how individuals value their health and possible health improvements. Several methods are used to calculate willingness-to-pay (WTP). The shared goal of these methods is to estimate how much an individual is willing to pay to avoid certain situations, such as death, disease or injury. The indirect WTP approach aims at revealing the value of health from observed behavior, for instance how many resources are used to reduce (or eliminate) health risks and job hazards. Similarly, estimations of wages needed for workers to choose unsafe jobs can reveal WTP. Direct WTP approaches involve asking people directly how much they are willing to pay to reduce or eliminate a health risk. Both of these approaches suffer from serious limitations. The drawback of the indirect approach is self-selection bias. People who choose to work in hazardous fields are not a random sample of the whole population. Moreover, it is not certain that the workers know the risks and make decisions considering all possible consequences. In the direct approach the respondents are asked to consider hypothetical situations which they may not have any experience with and might thus not fully comprehend the whole aspect of the situation and possible risks. Limitations on aforementioned WTP approaches are summarized by Harris et al. (1989).

A different methodology is to use the statistical relation between well-being, income and health (or other non-marketed goods) to calculate the monetary compensation needed to account for loss in well-being. This approach is termed compensating income variation (CIV) and is a possible solution to the abovementioned limitations in estimating WTP since the CIV is derived from a representative population sample with no hypothetical situations involved. CIV analysis can also in many cases be applied to already available data and is therefore a low cost method. Data needed for the CIV method are evaluations on well-being, prevalence of the non-marketed good being valued (such as a health impairment in our case) and household income. Other factors affecting welfare are included as covariates.

The CIV method has been used to value consequences of several non-marketed goods such as residential mobility (Weinberg, Friedman, & Mayo, 1981), crime (Powdthavee, 2005) and domestic violence (Santos, 2013). It has also been applied to some extent to health conditions such as disability (Morciano, Hancock, & Pudney, 2015), cardiovascular diseases (Groot & van den Brink, 2006; Groot, van den Brink, & Plug, 2004) and chronic pain (McNamee & Mendolia, 2014). Furthermore, Powdthavee and van den Berg (2011) used the same method to estimate the monetary values of thirteen health problems[1]. They used four different measures of well-being as the dependent variable; overall life satisfaction, mental well-being, health satisfaction and self-assessed health as their aim was to compare monetary value estimations by different measures of well-being.

A highly useful measurement in the process of valuing health is how much the quality of life decreases when living with a health impairment. Quality of life weights (QoLWs) are for example used in calculations of quality adjusted life years (QALYs). QALY is an important quantity in cost-utility analyses, as the goal of public health care is to maximize well-being by increasing overall health-related quality of life. A common method to estimate QoLWs is through surveys. People are for example asked how many years of living with a disease they would trade for one healthy life year. Another way is to present as options a life with a disease with certainty or perfect health with varying possibility of death and then to measure the probability of death that makes the respondents indifferent to the two options. Sometimes people with diseases are simply asked to value the quality of their life or medical professionals are asked to rate the quality of a life with the disease in question. As with the WTP methods discussed earlier these approaches suffer from limitations such as basing the estimate on hypothetical situations. In this study we follow a methodology to calculate QoLWs on a zero-one scale similar to the one proposed by Cutler & Richardson (1997) and adapted by Groot & van den Brink (2004).

The objective of the present study is to contribute to the literature on valuing health a broad-view analysis on eighteen sub-optimal health conditions by calculating

[1] 1:Problems with arms/legs/hands, 2:Difficulty seeing, 3:Difficulty hearing, 4:Skin conditions/allergies, 5:Chest/breathing problems, 6:Problems with heart and blood pressure, 7:Problems with stomach/kidney/liver, 8:Diabetes, 9:Nerves/anxiety/depression, 10:Alcohol/drug abuse, 11:Epilepsy, 12:Migraine/chronic headache and 13:Other health problems not listed.

corresponding quality of life weights, equivalence scales (ES) and resulting compensating income variation. Comparable models are used across different health conditions to facilitate within comparison, thus disease-specific comorbidity or adaptation is not controlled for. Therefore, due to lack of detail the aim is not to provide final WTP measures for each sub-optimal health condition but it is our hope that this study can form a basis for future work with more detailed disease-specific analyses.

2 Data and Methods

2.1 Data

The data used for the analysis originates from the survey "Health and well-being" of The Directorate of Health in Iceland. The survey has been carried out three times, in October 2007, 2009 and 2012 with the aim to gather data on health, well-being, lifestyle choices, demographics and labor-market status. In the first wave of the survey in 2007 the questionnaire was mailed to a stratified random sample of 9,711 Icelanders between the age of 18 and 79. The net response rate was 60.8%. In 2009 the modified questionnaire now including additional measures of the impact of the 2008 financial crisis was mailed to those who responded in 2007 and had agreed to be contacted again. The final sample size in 2009 was 5,294 with a response rate of 77.3%, resulting in a total of 42.1% response rate for the first two waves of the survey. 10,093 questionnaires were sent out in 2012. Thereof are 3,659 from the original sample and 6,434 new participants. Response rate was 55.0% for the new participants and 88.7% for the original sample, resulting in a total of 3,246 individuals participating in all three wave of the survey. Observations with missing key variables where omitted, resulting in 4,912 observations from 2007, 3,341 observations from 2009 and 5,538 observations from 2012 (thereof 2,878 from new participants). Pooled sample was used for the main analysis, but additional regressions differentiated by year and gender were also performed.

In this analysis two variables were used as measures of well-being. Those were satisfaction with life (SWL) and happiness. The first two waves of the survey (2007 and 2009) include five life satisfaction questions with seven response options from 1 (strongly disagree) to 7 (strongly agree). These five questions form a scale designed by Diener et al. (1985) to measure cognitive judgments of the respondents' life satisfaction. The five questions are: "In most ways my life is close to my ideal", "The conditions of my life are excellent", "I am satisfied with my life", "So far I have gotten the important things I want in life" and "If I could live my life over, I would change almost nothing". The sum of the responses was used to construct The Satisfaction with Life (SWL) Scale (Diener et al., 1985) ranging from 5 (extremely dissatisfied) to 35 (extremely satisfied).

All three waves of the survey (2007, 2009 and 2012) included a question on general happiness: "Taking all things together, how happy would you say you are?" The response

options varied from 1 (extremely unhappy) to 10 (extremely happy). Table 1 shows the distribution of the variables happiness and satisfaction with life. As in most studies on well-being and happiness our life satisfaction variables are highly skewed to the right.

Table 1. Distribution of the dependent variables happiness and satisfaction with life by years.

	2007	2009	2012
Happiness (1-10)	%	%	%
1 : Extremely unhappy	0.5	0.9	0.3
2	0.6	0.5	0.6
3	1.6	1,2	1.5
4	2.0	2.3	2.1
5	4.9	5.1	5.3
6	5.7	6.6	7.6
7	13.7	13.8	14.7
8	30.0	28.7	30.6
9	23.0	21.2	20.1
10 : Extremely happy	18.0	19.6	17.3
Satisfaction with Life (5-35)	%	%	
5-9: Extremely dissatisfied	0.9	0.8	-
10-14: Dissatisfied	2.4	2.8	-
15-19: Slightly dissatisfied	8.3	8.7	-
20: Neutral	3.1	3.7	-
21-25: Slightly satisfied	26.2	29.8	-
26-30: Satisfied	37.5	34.6	-
31-35: Extremely satisfied	21.5	19.5	-

Note: Only the first two waves of the survey included questions on life satisfaction.

The independent variables of interest in our analysis are equalized household income and dummy variables for health conditions. The household income variable is banded with fourteen income ranges. Respondents answered the question “In what range do you estimate your household’s income over the last 12 months?” by marking one of fourteen income ranges: from “less than 900 thousand ISK” to “more than 18 million ISK” (2007 version). The variable was coded as the midpoint value for each range. The OECD modified equivalence scale was used to scale the net household income to account for the fact that the household cost does not grow proportionally with each additional member. This scale assigns a value of 1 to the first adult, 0.5 to each additional adult and 0.3 to each child. All income variables were CPI-adjusted to July 2016 price level, to control for inflation and same date exchange rate of 122 krona per USD (Statistics Iceland, 2016).

The eighteen health conditions studied in this analysis are: Severely low vision (including blindness), severe hearing loss (including deafness), severe speech impediments, impaired physical mobility, lack of stamina, myositis, back or shoulder pain, hand pain, leg pain, frequent headaches, toothache, stomach pain, breathing difficulty, sleep difficulty, excessive worrying, anxiety, melancholy and menstrual cramps. The participants were asked if any of the listed health impairments had interrupted their daily life. Dummy variable was created for each condition, assigned 1 if the participant responded "yes, in the last 12 months" and 0 otherwise.

Summary statistics of the main variables differentiated by year and gender are provided in Table 2.

Table 2. Frequency distribution of the health conditions, satisfaction with life and happiness sorted by year and gender.

	2007		2009		2012	
	Male	Female	Male	Female	Male	Female
Health conditions (%)	N = 2,388	N = 2,528	N = 1,582	N = 1,773	N = 2,637	N = 2,934
Melancholy	15.2	23.5	14.9	24.4	16.9	26.5
Anxiety	20.1	28.1	21.0	29.5	21.4	30.9
Worry	17.5	25.6	19.0	26.8	19.9	29.0
Lack of stamina	15.8	24.4	17.0	28.4	17.1	30.2
Sleep difficulty	20.2	31.0	20.0	31.4	21.1	35.0
Impaired physical mobility	9.3	10.8	9.4	12.4	12.2	16.2
Breathing difficulty	7.3	11.4	6.9	11.0	7.1	12.3
Frequent headaches	9.8	20.9	8.4	18.4	8.8	21.4
Severe speech impediments	0.9	0.6	0.6	0.4	0.7	0.7
Abdominal pain	10.5	17.6	9.3	16.2	10.5	18.2
Severely low vision	3.7	4.2	2.7	3.9	3.1	4.1
Toothache	5.9	5.4	4.1	5.4	4.6	5.6
Arm pain	16.9	24.5	15.9	25.3	18.9	27.7
Leg pain	23.1	31.1	22.4	30.8	24.8	33.2
Severe hearing loss	4.4	3.0	5.3	3.4	5.4	3.4
Back or shoulder pain	37.4	49.0	34.6	49.0	40.0	52.8
Myositis	23.4	45.0	21.0	42.2	25.8	47.6
Menstrual pain	0.0	21.7	0.0	15.8	0.0	18.6
Satisfaction with life (5-35)	25.87	26.47	25.61	25.99	-	-
	(5.53)	(5.61)	(5.48)	(5.62)	-	-
Happiness (1-10)	7.95	7.97	7.95	7.92	7.87	7.87
	(1.72)	(1.70)	(1.76)	(1.79)	(1.71)	(1.68)

Note: These summary statistics are not weighted. They are provided first and foremost to show differences between the genders in health problem prevalence. There are almost no gender differences in the average level of life satisfaction and happiness. Figures for health conditions are proportions but figures for well-being measures are means with standard deviation in parentheses. Only the first two waves of the survey included questions on life satisfaction.

Other control-variables included in the empirical models were age, gender, year of survey, marital status, number of children in the household, degree of urbanization, labor-market status and education. Table 3 shows the weighted summary statistics of the covariates.

Standard errors were clustered on the individuals and sample weights were used to make our sample nationally representative. All statistical work was done using STATA 13. The study was approved by the Directorate of Health (1411120/5.6.1/gkg), the Ethics Board of Iceland (07-081, 09-094 and 12-107) and the Data Protection Authority of Iceland (S4455).

Table 3. Weighted summary statistics of independent variables, apart from the health conditions explored.

	2007 N = 4,912	2009 N = 3,341	2012 N = 5,528
Equalized yearly household income [a] (1000 ISK)	6,059	4,979	4,965
	(3,607)	(2,731)	(2,724)
Age	42.8	45.0	44.5
	(15.6)	(15.5)	(16.2)
Female *(%)*	48.0	48.8	48.8
Marital status (%)			
Single	14.9	12.7	14.0
Married	49.4	53.6	51.3
Steady	7.5	6.7	6.3
Cohabiting	21.1	19.1	21.3
Divorced	4.6	5.0	4.4
Widowed	2.3	2.7	2.5
Number of children in household	0.90	0.82	0.88
	(1.11)	(1.10)	(1.14)
Degree of urbanization (%)			
Population <200	6.1	6.2	7.2
Population <1000	5.5	5.1	5.8
Population <5000	14.5	14.2	17.0
Population >5000	73.8	74.4	70.0
Education (%)			
Lower secondary education	32.1	24.4	27.2
Vocational education	1.0	13.9	13.6
Upper secondary education	36.3	21.5	22.6
Bachelor or technical degree	21.4	24.7	24.0
Master or doctoral degree	8.8	10.7	11.2
Labor-market status (%)			
Unemployed	2.1	4.7	4.1
Out of labor force [b]	15.5	16.8	15.6

Note: a) The lowest household income midpoint in 2007 before equalization and CPI adjustment was 450,000 ISK and the highest 19,750,000 ISK.
b) Out of labor force includes retirees, homemakers, and people with disability.
Figures are means unless otherwise stated with standard deviation in parentheses.

2.2 Methods

2.2.1 Model

Our empirical model builds on previous literature (Groot et al., 2006, 2004; McNamee et al., 2014; Morciano et al., 2015). We assume that the well-being of an individual is influenced by income(Y), sub-optimal health status (H) and other individual traits (X). Let W^* in equation (1) denote the corresponding well-being function:

$$W^* = W^*(Y, H, X) \quad (1)$$

We furthermore assume that an individual's well-being is a linear function of the explanatory variables as shown in the following equation:

$$W^* = \beta_0 + \beta_1 \ln(Y) + \beta_2 \mathrm{H} + \sum_{k=1}^{q} \gamma_k \mathrm{X}_k + \varepsilon \quad (2)$$

To account for the recognized diminishing marginal utility of income and to make the income variable better resemble a normal distribution we use the natural log of income. H is a dummy variable equal to one in the presence of a health problem and equal to zero otherwise, and X are other individual traits traditionally controlled for in well-being functions. The betas are coefficients measuring the relationship between well-being and income and health condition and the gammas measure the effect of other factors. ε is an error term assumed to be normally distributed. Presuming that income increases well-being and sub-optimal health decreases well-being we expect $\beta_1 > 0$ and $\beta_2 < 0$.

Due to the nature of our dependent variables (ordinal but not cardinal) we opted for ordered probit regressions. Panel data usually implies using individual fixed effects to control for unobserved individual heterogeneity but due to small within-individual variability this was not feasible. Fixed effects model was tested on the data but results were by large statistically insignificant and therefore analyses on a pooled sample was chosen. Thus the participants who only answered the study once could be included. Moreover, a control for age could also be included which is vital when analyzing health data since age is strongly correlated with health.

Our model was evaluated separately with happiness and satisfaction with life as a dependent variable, consequently serving as robustness check to each other. Since SWL was only included in the first two waves of the survey while happiness was included in all

three waves we analyze happiness both using all three waves and only with two waves for better comparison with SWL results. Furthermore, two different sets of control variables were used. In Model 1 the control variables were age, age squared, gender, marital status, degree of urbanization, number of children in the household and year of survey. As the effect of income on well-being is partly explained by labor-market status and education, including those variables as covariates might bias the point estimate for income in our analyses (Groot & van den Brink, 2004). Hence, the main focus is on Model 1. Nonetheless, controlling for labor-market status might capture the effect of leisure time and as education is known to impact income, both variables are added in Model 2.

2.2.2 Equivalence Scale (ES) and Compensating Income Variation (CIV)

The point estimates are used to calculate the amount needed to make an individual with an health impairment reach the same level of well-being (life satisfaction or happiness) as a healthy individual. This amount is termed compensating income variation (CIV). We introduce the term equivalence scale (ES) as the ratio between the income of an individual with certain health impairment and the income of a healthy individual where both individuals are as well off with respect to well-being:

$$ES = \begin{cases} \dfrac{Y(X; W, H = 1)}{Y(X; W, H = 0)}, & if\ \beta_2 \leq 0 \\ 1, & otherwise \end{cases} \qquad (3)$$

According to this definition, $ES \geq 1$ as one would expect that health problems cannot be associated with higher well-being. $ES = 1$ would indicate that no compensation is needed and $ES < 1$ would indicate that lower income is needed for an individual with health impairment to reach the same level of well-being.

Combining equations (2) and (3) and assuming $\beta_2 \leq 0$ results in:

$$\ln(ES) = \ln\left(\frac{Y(X;W;H=1)}{Y(X;W;H=0)}\right)$$
$$= \ln\big(Y(X;W;H=1)\big) - \ln\big(Y(X;W;H=0)\big)$$
$$= \frac{-\beta_2}{\beta_1} \qquad (4)$$

Or:
$$\mathrm{ES} = \exp\left(\frac{-\beta_2}{\beta_1}\right) \qquad (5)$$

The equivalence scale can also be written as:

$$ES = \frac{\bar{y} + CIV}{\bar{y}} \qquad (6)$$

Where $\bar{y}$ is the average equalized household income of the whole sample and CIV is the additional amount needed to account for loss in well-being when suffering from a health problem.

Thus we calculate the CIV using[2]:

$$CIV = \bar{y} \cdot (ES - 1) \qquad (7)$$

2.2.3 Quality of Life Weights (QoLWs)

Following Groot & van den Brink (2004) we also used the point estimates from the ordered probit regressions to calculate the quality of life weights (QoLWs). The method described by Groot et al. is comparable to the process described by Cutler and Richardson (1997, 1998) to calculate quality adjusted life years (QALYs). The β_2 estimator has infinite range, but can be normalized to a zero-one range. The cut points from the ordered probit regressions were used for normalization, consequently returning QoLWs on a scale of 0 to 1:

$$QoLW = 1 + \frac{\beta_2}{\alpha_{n-1} - \alpha_1} \qquad (8)$$

[2] Setting $\mathrm{W}(\bar{y} + \mathrm{CIV}, \mathrm{H} = 1) = \mathrm{W}(\bar{y}, \mathrm{H} = 0)$ and solving for CIV gives the same result, since $ES = \frac{\bar{y}+CIV}{\bar{y}}$.

Where *n* is the number of response options of the well-being variable (life satisfaction or happiness) and the alphas are the second highest and second lowest cut off points, (assuming that $\alpha_n = \infty$ and $\alpha_0 = -\infty$). This stems from the general definition of an ordered probit model where we assume that the range of the probability function of life satisfaction and happiness is infinite (Cameron & Trivedi, 2005).

2.2.4 CIV and QoLWs Analyses by Gender and Year

Additional regressions were performed in order to shed light on whether the results differ by gender. Since the economic environment in Iceland[3] (and world-wide) changed dramatically between 2007 and 2009 these regressions were also done for the 2007 and 2009 samples separately. For simplicity, these analyses were only done for Model 1 and satisfaction with life as the dependent variable, chosen because of overall statistically significant results in other analyses in this study.

[3] Between 2007 and 2009 CPI went up by 27% and unemployment went from 1.9% to 6.7%.

3 Results

Point estimates from the ordered probit regressions on happiness and satisfaction with life are shown in Table 4.

Table 4. Ordered probit well-being regressions estimates using happiness and satisfaction with life as the dependent variables.

	Happiness: Two waves (2007 and 2009)		Happiness: Two waves (2007 and 2009)		SWL: Two waves (2007 and 2009)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	N=14,428	N=13,787	N=8,645	N=8,259	N=8,601	N=8,118
Melancholy	-0.915	-0.908	-0.943	-0.938	-0.853	-0.846
	(0.028)***	(0.029)***	(0.036)***	(0.037)***	(0.037)***	(0.038)***
Income	0.131	0.102	0.101	0.074	0.245	0.169
	(0.022)***	(0.023)***	(0.026)***	(0.027)***	(0.029)***	(0.031)***
Worry	-0.750	-0.744	-0.740	-0.731	-0.725	-0.713
	(0.027)***	(0.027)***	(0.035)***	(0.035)***	(0.035)***	(0.036)***
Income	0.114	0.084	0.086	0.062	0.226	0.155
	(0.022)***	(0.023)***	(0.026)***	(0.027)**	(0.029)***	(0.030)***
Anxiety	-0.731	-0.728	-0.751	-0.748	-0.739	-0.735
	(0.027)***	(0.027)***	(0.034)***	(0.034)***	(0.034)***	(0.035)***
Income	0.125	0.097	0.095	0.072	0.236	0.165
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Lack of stamina	-0.493	-0.485	-0.491	-0.481	-0.559	-0.540
	(0.027)***	(0.028)***	(0.035)***	(0.036)***	(0.037)***	(0.037)***
Income	0.138	0.107	0.101	0.073	0.234	0.159
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Sleep difficulty	-0.514	-0.514	-0.522	-0.514	-0.503	-0.481
	(0.026)***	(0.026)***	(0.033)***	(0.034)***	(0.034)***	(0.034)***
Income	0.148	0.114	0.113	0.084	0.249	0.173
	(0.022)***	(0.024)***	(0.027)***	(0.028)***	(0.030)***	(0.031)***
Impaired phys. mobility	-0.368	-0.356	-0.428	-0.407	-0.454	-0.433
	(0.034)***	(0.035)***	(0.045)***	(0.047)***	(0.044)***	(0.046)***
Income	0.155	0.121	0.118	0.087	0.252	0.174
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.029)***	(0.031)***
Breathing difficulty	-0.409	-0.404	-0.382	-0.380	-0.415	-0.404
	(0.037)***	(0.038)***	(0.048)***	(0.048)***	(0.051)***	(0.050)***
Income	0.150	0.114	0.113	0.080	0.245	0.166
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Frequent headaches	-0.344	-0.339	-0.340	-0.331	-0.392	-0.383
	(0.031)***	(0.032)***	(0.040)***	(0.041)***	(0.039)***	(0.040)***
Income	0.152	0.115	0.115	-0.083	0.248	0.169
	(0.022)***	(0.023)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Abdominal pain	-0.324	-0.321	-0.318	-0.313	-0.371	-0.357
	(0.032)***	(0.033)***	(0.042)***	(0.042)***	(0.044)***	(0.044)***
Income	0.153	0.116	0.113	0.080	0.244	0.165
	(0.022)***	(0.023)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Severe speech impedim.	-0.332	-0.314	-0.307	-0.295	-0.376	-0.302
	(0.161)**	(0.163)*	(0.196)	(0.201)	(0.200)*	(0.203)
Income	0.164	0.126	0.126	0.092	0.259	0.178
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Severely low vision	-0.279	-0.259	-0.326	-0.286	-0.346	-0.288
	(0.060)***	(0.063)***	(0.077)***	(0.081)***	(0.076)***	(0.077)***
Income	0.161	0.123	0.123	0.090	0.255	0.176
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***

Toothache	-0.286	-0.294	-0.226	-0.234	-0.291	-0.296
	(0.048)***	(0.047)***	(0.059)***	(0.060)***	(0.067)***	(0.065)***
Income	0.156	0.117	0.120	0.085	0.251	0.170
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Arm pain	-0.253	-0.248	-0.247	-0.236	-0.289	-0.252
	(0.026)***	(0.027)***	(0.034)***	(0.035)***	(0.033)***	(0.033)***
Income	0.159	0.124	0.120	0.089	0.252	0.175
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Leg pain	-0.241	-0.240	-0.241	-0.240	-0.281	-0.270
	(0.025)***	(0.025)***	(0.032)***	(0.033)***	(0.032)***	(0.033)***
Income	0.156	0.122	0.120	0.089	0.251	0.175
	(0.022)***	(0.023)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Severe hearing loss	-0.175	-0.202	-0.139	-0.148	-0.271	-0.281
	(0.062)***	(0.064)***	(0.080)*	(0.084)*	(0.077)***	(0.079)***
Income	0.165	0.126	0.127	0.092	0.260	0.179
	(0.022)***	(0.024)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Back or shoulder pain	0.232	-0.234	-0.236	-0.233	-0.249	-0.237
	(0.023)***	(0.023)***	(0.029)***	(0.030)***	(0.029)***	(0.029)***
Income	0.158	0.122	0.122	0.090	0.255	0.177
	(0.022)***	(0.023)***	(0.026)***	(0.028)***	(0.030)***	(0.031)***
Menstrual pain	-0.187	-0.183	-0.184	-0.181	-0.239	-0.237
	(0.039)***	(0.040)***	(0.049)***	(0.050)***	(0.051)***	(0.051)***
Income	0.203	0.159	0.150	0.102	0.297	0.204
	(0.030)***	(0.031)***	(0.035)***	(0.037)***	(0.039)***	(0.040)***
Myositis	-0.225	-0.227	-0.186	-0.183	-0.227	-0.217
	(0.025)***	(0.025)***	(0.032)***	(0.033)***	(0.032)***	(0.032)***
Income	0.157	0.121	0.120	0.088	0.252	0.174
	(0.022)***	(0.023)***	(0.026)***	(0.028)***	(0.029)***	(0.031)***

Note: *** p<0.01, ** p<0.05, * p<0.10. Standard error is shown in parentheses. Note that the income variable has been transformed with the natural logarithm. Model 2 additionally controls for labor market status and education.

All the health impairments are associated with decreased happiness and satisfaction with life. The only health impairment that is not statistically significantly related to the well-being measures is the estimator for severe speech impediments, but very few observations are recorded for that particular health condition (less than 1% of our sample). We however include such rare health conditions to avoid the appearance of cherry picking. As for the covariates, they are generally statistically significant[4] except the dummy for rural residency. In some of the regressions the ´divorced´ dummy is insignificant and the year dummy is only significant in Model 2. It is evident from the regressions, and maybe not surprising, that mental illnesses are negatively related to happiness and satisfaction with life to a much greater extent than physical impairments.

[4] In Appendix B, two SWL regression output examples are provided: Model 1 and Model 2 for back /shoulder pain, using a pooled sample from 2007 and 2009.

As expected, income is positively related to happiness and well-being and seems to have bigger impact on happiness than satisfaction with life. Regressions for happiness using only the first two waves of the survey were included for comparison with regression for life satisfaction since questions on life satisfaction were omitted in the 2012 questionnaire. Although very similar, the point estimates for the health impairments tend to be slightly larger in absolute value in models where SWL is used as the dependent variable. The point estimates for income are higher for SWL than for happiness. Furthermore, in the happiness analyses the impact of income is somewhat lower for mental illnesses compared to physical problems, while the SWL income estimate is stable across the health problems.

The point estimates shown in Table 4 are then used to calculate corresponding QoLWs, ESs and CIVs. Including covariates on labor-market status and education as in Model 2 decreases the point estimates on income hence inflating ESs and CIVs.

3.1 Equivalence Scale and Compensating Income Variation

Equivalence scales (ES) were calculated as demonstrated in equation (5) using the point estimates from Table 4. The results are displayed in Table 5 and ranked by the results from SWL and Model 1. It is evident from Table 5 that the equivalence scales for mental impairments are quite high but substantially lower when focusing on satisfaction with life instead of happiness. Note also that using happiness as the dependent variable with two waves of the survey does not generate statistically significant results except for a few conditions (and only at the 10% significance level). Comparing the models and well-being measures, satisfaction with life used with Model 1 gives statistically significant results on all health problems except for severe speech impediments and it is the only model that gives statistically significant ES results for mental illnesses.

Table 5. Equivalence scales calculated using point estimates from Table 4.

	Happiness (Full sample)		Happiness (Two waves)		Satisfaction with life (Two waves)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	N=14,428	N=13,787	N=8,645	N=8,259	N=8,601	N=8,118
Melancholy	1089.77	7199.92	11172.66	315119.17	32.61**	147.50
Worry	723.93	6775.96	5265.47	120663.80	24.57**	99.49
Anxiety	338.22	1766.22	2731.76	30426.53	23.03**	86.02
Lack of stamina	35.84*	92.67	126.69	696.14	10.91***	29.69
Sleep difficulty	32.12*	91.48	100.48	451.93	7.54***	16.23*
Impaired phys. mobility	10.71**	19.15	37.50	105.34	6.09***	11.95*
Breathing difficulty	15.24**	34.99	29.61	119.03	5.45***	11.46*
Frequent headaches	9.67**	19.15	19.06	54.71	4.87***	9.61**
Abdominal pain	8.31***	15.92	16.68	49.23	4.57***	8.64**
Severe speech impedim.	7.58	12.15	11.39	25.01	4.27	5.44
Severely low vision	5.67**	8.16	14.19	24.27	3.88***	5.14**
Toothache	6.29**	12.41	6.58	15.57	3.19***	5.69**
Arm pain	4.92***	7.33**	7.81	14.24	3.14***	4.22***
Leg pain	4.71***	7.17**	7.48*	14.99	3.06***	4.68***
Severe hearing loss	2.90**	4.96*	2.98	4.94	2.84***	4.81*
Back or shoulder pain	4.34***	6.81**	6.91*	13.45	2.65***	3.82***
Menstrual pain	3.38***	5.20**	4.57*	9.62	2.52***	4.54**
Myositis	4.16***	6.51**	4.71*	8.04	2.46***	3.48***

Note: *** p<0.01, ** p<0.05, * p<0.10. Health conditions are ordered by SWL Model 1.

The monetary compensation (CIV) was calculated using equation (7) and the results in USD are shown in Table 6 (see Table A1 in Appendix A for CIVs in ISK). The mean of annual equalized household income used to obtain CIV was 5,024,371 ISK (41,183 USD) at July 2016 price level (Central Bank of Iceland, 2016; Statistics Iceland, 2016). Since CIV are proportional to ES the CIV are quite high for the mental impairments. Perhaps the well-being measures used, particularly happiness, have caused this dramatic difference between CIVs for mental illnesses and other health problems. Focusing on Model 1 and satisfaction with life our highest CIV is 1,301,758 USD for melancholy and the lowest is 60,084 USD for myositis. Approximately ranking in the middle is frequent headaches valued at 159,301 USD per annum. As with the ES results, satisfaction with life used with Model 1 gives statistically significant results on all health problems except for severe speech impediments and is the only model that gives statistically significant results for mental illnesses.

Table 6. CIV monetary values for happiness and SWL (USD).

	Happiness (Full sample)		Happiness (Two waves)		Satisfaction with life (Two waves)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	N=14,428	N=13,787	N=8,645	N=8,259	N=8,601	N=8,118
Melancholy	44,839,282	296,475,671	460,086,759	12,977,627,827	1,301,758**	6,033,439
Worry	29,772,669	279,015,689	216,808,610	4,969,300,599	970,841**	4,056,270
Anxiety	13,887,818	72,697,842	112,461,933	1,253,025,948	907,298**	3,501,453
Lack of stamina	1,434,969*	3,775,240	5,176,404	28,628,331	408,090***	1,181,458
Sleep difficulty	1,281,625*	3,726,342	4,096,887	18,570,835	269,263***	627,167*
Impaired phys. mobility	399,846**	747,392	1,503,271	4,297,034	209,432***	451,064*
Breathing difficulty	586,261**	1,399,623	1,178,291	4,860,899	183,154***	430,971*
Frequent headaches	357,075**	747,608	743,612	2,211,972	159,301***	354,418**
Abdominal pain	301,174***	614,448	645,708	1,986,168	146,996***	314,467**
Severe speech impedim.	271,130	459,203	427,795	988,625	134,737	182,664
Severely low vision	192,414**	294,991	543,093	958,270	118,465***	170,695**
Toothache	217,713**	469,719	229,776	600,067	90,001***	192,978**
Arm pain	161,599***	260,660**	280,287	545,212	88,010***	132,444***
Leg pain	152,739***	253,906**	267,057*	576,295	84,797***	151,653***
Severe hearing loss	78,061**	162,993*	81,656	162,375	75,667***	156,920*
Back or shoulder pain	137,469***	239,283**	243,340*	512,754	67,880***	116,123***
Menstrual pain	97,868***	172,978**	147,158*	354,861	62,419***	145,722**
Myositis	130,344***	226,825**	152,699*	290,063	60,084***	102,309***

Note: *** p<0.01, ** p<0.05, * p<0.10. Results are ordered by SWL Model 1. Results in ISK are provided in Appendix A.

3.2 Quality of Life Weights

Quality of life weights were calculated using equation (8) and the results are presented in Table 7. A comparison of two-wave results between happiness and satisfaction with life shows similar results, especially when focusing on the physical impairments (difference not exceeding about 5% difference). Slightly more difference is observed when comparison is made for the mental impairments (though not exceeding 9%). All results are statistically significant at the 1% level, except for severe speech impediments. As expected the lowest QoLW is for melancholy and the other mental illnesses while myositis has the smallest effect on quality of life.

Table 7. QoLWs calculated using point estimates from Table 4.

	Happiness (Full sample)		Happiness (Two waves)		Satisfaction with life (Two waves)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	N=14,428	N=13,787	N=8,645	N=8,259	N=8,601	N=8,118
Melancholy	0.777***	0.781***	0.763***	0.766***	0.835***	0.840***
Anxiety	0.818***	0.821***	0.807***	0.809***	0.855***	0.859***
Worry	0.814***	0.817***	0.809***	0.813***	0.857***	0.863***
Lack of stamina	0.873***	0.877***	0.869***	0.873***	0.888***	0.894***
Sleep difficulty	0.869***	0.870***	0.862***	0.865***	0.899***	0.905***
Impaired phys. mobility	0.904***	0.908***	0.885***	0.892***	0.908***	0.914***
Breathing difficulty	0.894***	0.896***	0.897***	0.899***	0.915***	0.919***
Frequent headaches	0.911***	0.913***	0.909***	0.912***	0.920***	0.924***
Severe speech impedim.	0.913	0.919	0.917	0.921	0.923	0.939
Abdominal pain	0.916***	0.917***	0.914***	0.917***	0.925***	0.929***
Severely low vision	0.927***	0.933***	0.912***	0.924***	0.929***	0.942***
Toothache	0.925***	0.924***	0.939***	0.937***	0.940***	0.941***
Arm pain	0.934***	0.936***	0.933***	0.937***	0.941***	0.949***
Leg pain	0.937***	0.938***	0.935***	0.936***	0.943***	0.946***
Severe hearing loss	0.954***	0.948***	0.962***	0.960***	0.944***	0.944***
Back or shoulder pain	0.939***	0.940***	0.936***	0.938***	0.949***	0.953***
Menstrual pain	0.948***	0.947***	0.949***	0.946***	0.951***	0.947***
Myositis	0.941***	0.942***	0.950***	0.951***	0.954***	0.957***

Note: *** p<0.01, ** p<0.05, * p<0.10. Results are ordered by SWL Model 1.

3.3 CIV and QoLWs Analyses by Gender

CIV results from separate analyses by gender and year are shown in Table 8[5] and QoLWs from the same regressions are found in Table 9.

Table 8. CIV (USD) sorted by gender and year. Model 1 is used with SWL as the dependent variable.

	2007		2009		2007 + 2009	
	Males	Females	Males	Females	Males	Females
	N=2,437	N=2,608	N=1,695	N=1,861	N=4,132	N=4,469
Melancholy	1,867,905	1,224,657*	1,348,720	668,525*	1,732,439	899,557**
Worry	1,129,866	953,962	934,689	619,070	1,108,449	753,197**
Anxiety	997,323	795,702*	872,596	694,163	986,952	734,009**
Lack of stamina	646,998	251,273***	635,163	251,029**	683,086	251,586***
Sleep difficulty	374,383*	194,332***	343,731	211,016**	368,937*	200,357***
Impaired phys. mobility	357,495	152,153***	280,208	132,564***	344,129*	140,061***
Breathing difficulty	147,910*	147,674***	358,068	124,755**	226,879*	138,980***
Frequent headaches	128,089**	83,770***	854,323	99,792***	333,504*	91,007***
Abdominal pain	146,408**	125,314***	174,077	100,291***	169,504*	112,965***
Severe speech impedim.	697,870	21,205	-34,220	782,003	92,343	173,234
Severely low vision	108,169*	142,943**	97,735	107,013*	109,376*	118,789***
Toothache	26,427	314,753**	10,524	125,691**	19,992	200,986***
Arm pain	63,709***	93,203***	89,533*	80,386***	78,907	86,129***
Leg pain	75,761***	77,724***	76,659*	89,650***	79,642	84,188***
Severe hearing loss	86,809	66,378**	48,631	86,933**	71,305*	76,881***
Back or shoulder pain	55,861***	61,304***	67,202**	76,186***	63,097***	68,882***
Menstrual pain	-	37,969***	-	68,789***	-	50,770***
Myositis	83,798***	41,750***	57,207**	55,748***	74,991***	48,019***

Note: *** p<0.01, ** p<0.05, * p<0.10. Ordering of the health conditions is kept the same as in previous tables, thus not entirely in descending order. As with previous CIV calculations the average equalized household income from the whole sample (41,183 USD) was used to obtain CIV from ES.

The CIV results in Table 8 allow us to compare CIVs between males and females in 2007, between males and females in 2009, between males in 2007 and in 2009, females in 2007 and in 2009 and finally between males and females in both years. As an example low vision has more negative effect on women, but sleep difficulties, impaired physical mobility, frequent headaches and myositis affect men more severely. These results also show the difference in statistical significance between the genders. CIVs for females are generally statistically significant where many CIVs for males are lacking statistical significance. Results for males in 2009 especially lack statistical significance. In these gender analyses it should be kept in mind that health problems prevalence in the sample

[5] Corresponding ES values and CIV in ISK can be found in Appendix C.

analyzed is higher for women than men as is evident from Table 2. Income is about 20% higher in 2007 than in 2009 (see Table 3) and Table 1 shows a slight decrease in SWL between those years and is noteworthy for main variables. As seen in Table 8 not everyone from the 2007 survey chose to answer the survey in 2009 (about 70% answered both years) so the results can be biased due to self-selection. Table D1 in Appendix D compares QoLWs, ESs and CIVs between 2007 and 2009 with the genders pooled together.

Table 9. QoLWs sorted by gender and year. Model 1 is used with SWL as the dependent variable.

	2007		2009		2007 + 2009	
	Males	Females	Males	Females	Males	Females
	N=2,437	N=2,608	N=1,695	N=1,861	N=4,132	N=4,469
Melancholy	0.837***	0.838***	0.850***	0.822***	0.842***	0.828***
Worry	0.860***	0.859***	0.875***	0.842***	0.868***	0.849***
Anxiety	0.860***	0.859***	0.875***	0.832***	0.868***	0.844***
Lack of stamina	0.881***	0.902***	0.890***	0.882***	0.885***	0.892***
Sleep difficulty	0.894***	0.910***	0.905***	0.885***	0.900***	0.898***
Impaired phys. mobility	0.895***	0.919***	0.916***	0.900***	0.904***	0.910***
Breathing difficulty	0.926***	0.921***	0.909***	0.911***	0.918***	0.915***
Frequent headaches	0.933***	0.941***	0.877***	0.919***	0.905***	0.930***
Abdominal pain	0.930***	0.927***	0.931***	0.922***	0.929***	0.924***
Severe speech impedim.	0.858***	0.977	1.079	0.798	0.946**	0.898
Severely low vision	0.936**	0.919***	0.948***	0.913***	0.941***	0.917***
Toothache	0.976	0.885***	0.990	0.907***	0.982	0.895***
Arm pain	0.955***	0.938***	0.951***	0.928***	0.952***	0.932***
Leg pain	0.950***	0.943***	0.956***	0.923***	0.953***	0.933***
Severe hearing loss	0.944**	0.947***	0.966	0.921***	0.954***	0.934***
Back or shoulder pain	0.959***	0.951***	0.958***	0.931***	0.958***	0.941***
Menstrual pain	1.000***	0.964***	1.000***	0.935***	1.000***	0.951***
Myositis	0.948***	0.962***	0.962**	0.943***	0.954***	0.953***

Note: *** p<0.01, ** p<0.05, * p<0.10

Results in Table 9 show higher significance levels than for CIVs as QoLW is only obtained from one point estimate (health) whereas CIVs are derived from both income and health point estimates. QoLW for severe speech impediments is only significant when looking a males in 2007 and when combining males in 2007 and 2009.

Although the accuracy of the gender analyses could be questioned there are differences between the genders that should not be ignored without more detailed analyses in future studies.

4 Discussion and Conclusion

The focus of this work was to estimate the monetary value of recovering from eighteen different health conditions using the CIV approach with two different measures of well-being. The CIV method has certain advantages over other methods used to estimate willingness to pay since it does not rely on a self-selected sample or hypothetical situations. Furthermore, it can in many cases be applied to already available data. The aim of this study was to create a basis for further research by providing estimation on compensation needed to keep a person with these health problems at the same level of wellbeing as one who does not suffer from that particular health condition.

QoLWs, ESs and CIVs have been calculated using different model specifications; different sets of dependent variables, different sets of covariates and different samples. The lowest QoLWs and the highest CIVs are observed for mental illnesses (melancholy, worry and anxiety), as might be expected, but note that the results are not as dramatic when SWL is used as a well-being proxy instead of happiness. Perhaps happiness is not suitable when valuing mental illnesses, since decreased general happiness is a symptom of those disorders. Considering statistical significance SWL seems to be better suited as a measure of well-being than happiness. Life satisfaction correlates with melancholy, anxiety and worrying but the SWL variable consists of five detailed questions inquiring about the respondent's satisfaction and might thus be a better proxy for well-being than one question on general happiness. The point estimates for the health impairments tend to be slightly larger in absolute value in models where SWL is used as the dependent variable compared to happiness but income has more impact on SWL than happiness. Furthermore, in the SWL analyses the point estimates for income are similar across the different health problems but in the happiness analyses the point estimates for income are somewhat lower for the estimations of mental illnesses, resulting in inflated ESs (and thus CIVs).

The QoLWs are more stable across different regression specifications, which is understandable as those estimates are only derived from the health condition estimator and cut-points of the distribution of the wellbeing variable as opposed to the ratio between two point estimates as is the case for ES (and consequently CIV).

As for ranking of the conditions, mental disorders have the most negative impact on life satisfaction, and myositis and menstrual cramps have the least impact. Pain of various sorts rank in the middle, severely low vision is worse than severe hearing loss and frequent headaches worse than toothache, for example.

Powdthavee and van den Berg (2011) calculate what they call shadow price of several different health problems using the CIV method but use different proxies for wellbeing in order to compare monetary values across different well-being measures. These proxies are overall life satisfaction, mental well-being, health satisfaction and self-assessed health. Their CIVs using life satisfaction as a well-being proxy are notably lower compared to the other measures. Their use of health satisfaction and self-assessed health as measures of well-being result in dramatically high monetary values. Their CIV range for each health problem is extremely wide when they include all well-being measures. One might wonder whether health satisfaction and self-assessed health are suitable measures of well-being where health conditions are under investigation. Six of the health problem categories examined by Powdthavee and van den Berg have matching conditions in our analysis. Those are problems related to arms, legs, arm, feet, back, etc. (as a group), difficulty seeing, difficulty hearing, chest/breathing problems, depression/anxiety and migraine/frequent headaches. At July 2016 price level they value problems connected with arms, legs, arm, feet, back, etc. at 10,500 USD per annum using life satisfaction (but 76,500 USD when using mental wellbeing). As an example of their high prices obtained from using health satisfaction and self-assessed health is the CIV for this group of health problems at $4 \cdot 10^{15}$ USD (using health satisfaction as well-being proxy). Our average estimate for our three health problems fitting this group (that is arm pain, leg pain and back/shoulder pain) is around 80,229 USD per annum if we focus on Model 1 and SWL for simplicity. Their estimate for low vision is 31,500 USD per annum using life satisfaction (354,000 USD using mental well-being) whereas our estimate is approximately 118,456 USD. Their yearly value of recovering from hearing difficulties is 9,000 USD using life satisfaction (but 33,000 USD using mental well-being) compared to our 75,667 USD. Their yearly value of breathing problems is 19,500 USD per annum compared to our estimate of 183,154 USD. Depression/Anxiety is valued at 682,696,500 USD were our estimate is

around 1,059,966 USD[6]. And finally their estimate for migraine/frequent headaches is 43,500 USD compared to our estimate of 159,301 USD. Our results are generally higher when comparing to their SWL results but if we compare our results to CIVs from their other well-being measures, our estimates would be extremely low in comparison. The work presented by Powdthavee and van den Berg shows that great thought needs to be put in the choice of a suitable well-being measure.

Groot & van den Brink (2004) estimated the CIV of severe headaches between 20,700 USD and 29,000 USD per year at July 2016 price levels. We find that yearly CIV for frequent headaches is much higher, or 159,000 USD. Groot & van den Brink also calculated QoLW for migraine using the same method as used in this study and report that migraine reduces quality of life by 4-6% compared to our result of 8-9%.

McNamee & Mendolia (2014) estimated that yearly CIV of chronic pain is 258,234 USD at July 2016 price levels using one life satisfaction question ranging from 0-10. Our health problems question does not specify whether it is chronic but our CIV range for problems indicating pain is from back/shoulder pain at 67,880 USD to frequent headaches at 159,301 USD.

We compared our QoLWs to other QoLWs listed in the Cost-Effectiveness Analysis Registry (Neumann & Cohen, 2016) and see that our QoLWs are consistently higher. Note that the methodology is usually different in the studies used in the comparison. Generally direct questionnaires used to estimate QoLWs in the literature referred to here. Note also that our health problems are mainly ailments but not clinically defined diseases which might explain why our QoLWs are higher. In some cases we could fit our health conditions as symptoms to diseases in the registry. Even though our QoLWs are generally statistically significant we simplify our QoLWs comparison by focusing on our results from SWL and Model 1, since those regressions gave the most statistically significant ES and CIV results. Our QOLW for melancholy is 0.835 and is our lowest weight. Vallejo-Torres et al. (2015) find QoLW for moderate depression to be 0.558 and Beil et al. (2013) find QoLW for depression to be 0.59. The difference is substantial but melancholy is also not as serious

[6] Our estimate is the average for anxiety, worry and melancholy. Note that we look at melancholy, not clinical depression.

as clinical depression. Our QoLWs for anxiety and worry are 0.855 and 0.857 respectively, compared to general anxiety at baseline as 0.6 from Goorden et al. (2014) which also is substantially lower than our estimate. We find the QoLW for sleep difficulties to be 0.899 compared to 0.402 for chronic insomnia from Snedecor et al. (2009) and 0.76 for severe insomnia in Botteman et al. (2007). Our QoLW for breathing difficulties is 0.915 which we decided to compare to asthma. Zafari et al. (2014) use three QoLWs for asthma, 0.842 for uncontrolled asthma, 0.9 for partially controlled asthma and 0.946 for controlled asthma. We find the QoLWs for frequent headaches to be 0.920 compared to 0.73 for 0-3 migraine headaches per day from Batty et al. (2013). And as was mentioned previously Groot & van den Brink (2004) estimated QoLW for migraines to be between 0.93 and 0.96 (using the same method as presented here). Our estimate for severely low vision (or blindness) is 0.929 compared to 0.77 for visual impairment and 0.61 for blindness in Schwander (2014). We find the QoLW for severe hearing loss (or deafness) to be 0.944 compared to 0.78 for treated hearing loss in Edfeldt et al. (2014). As mentioned above our generally higher quality of life weights could be partly explained by the fact that our health variables cover ailments instead of clinically diagnosed diseases. Strong welfare system in Iceland could also partly explain the difference. However, methodological variations between studies cannot be ignored and should be explored in future research. Furthermore it should be noted that quality of life with a certain illness is not a fixed number, rather an estimate that is context- and time specific to some degree. For example, new technologies and social changes have the potential to improve patients' quality of life. Cutler & Richardson (1997) calculated the QoLWs for several diseases for the years 1970 and 1990, including hearing impairment, low vision and blindness. QoLW for hearing impairment increased between 1970 and 1990 from 0.91 to 0.93, for low vision from 0.84 to 0.93 and for blindness from 0.73 to 0.87. Their results resemble our QoLWs more than weights from the CEA registry but it should be noted that our QoLWs methodology is based on the one Cutler & Richardson proposed while the utility weights from the CEA registry are in most cases estimated from direct surveys.

Results divided by gender show interesting differences that call for additional research. For example, low vision has more negative effect on women, but sleep difficulties, impaired physical mobility, frequent headaches and myositis affect men more. Our comparison between the years 2007 and 2009 could be biased due to self-

selection since about 30% of those answering the questionnaire in 2007 chose not to answer it in 2009. But we could also be detecting effects of the recession in 2008. Recession or self-selection aside and focusing on results from 2007, differences between the genders are noticeable. Groot & van den Brink (2004) investigated ES, CIV and QoLW for migraine by gender. Although their models are not fully comparable to ours their ES estimate for men is also higher than for women in their most relatable model. Their QoLWs of migraine does not, however, differ between genders. Health problem prevalence in our sample seems to be generally higher for women than for men. Whether that is real or if women answer these questions with a different mindset is not known, but should be kept in mind in further research on gender differences on CIVs.

It should also be emphasized that the results presented here are based on models that do not correct for co-morbidity and thus do not entail disease-specific analyses. Another point to be made is that better information on income would benefit CIV studies greatly. Our income variable was banded in nature, with wide income ranges. Further studies could also include possible adaptation to chronic conditions.

This research provides an interesting starting point for further research and gives important information on monetary values of several health conditions. Although not without limitations the strength of this study is that is provides a ranking between the conditions as several different health conditions were valued with the same sample and same methodology. Such ranking between health conditions is helpful for policy makers in prioritizing scarce resources

References

Batty, A. J., Hansen, R. N., Bloudek, L. M., Varon, S. F., Hayward, E. J., Pennington, B. W., … Sullivan, S. D. (2013). The cost-effectiveness of onabotulinumtoxinA for the prophylaxis of headache in adults with chronic migraine in the UK. *Journal of Medical Economics*, *16*(7), 877–887. http://doi.org/10.3111/13696998.2013.802694

Beil, H., Beeber, L. S., Schwartz, T. A., & Lewis, G. (2013). Cost-effectiveness of alternative treatments for depression in low-income women. *The Journal of Mental Health Policy and Economics*, *16*(2), 55–65.

Botteman, M. F., Ozminkowski, R. J., Wang, S., Pashos, C. L., Schaefer, K., & Foley, D. J. (2007). Cost effectiveness of long-term treatment with eszopiclone for primary insomnia in adults: a decision analytical model. *CNS Drugs*, *21*(4), 319–334.

Cameron, C., & Trivedi, P. (2005). *Microeconometrics: Methods and Applications*. Cambridge, New York: Cambridge University Press.

Central Bank of Iceland. (2016). Selling rate on July 25th 2016. Retrieved July 26, 2016, from http://www.cb.is/default.aspx?pageid=fcac51d5-09ce-11e5-93fa-005056bc0bdb

Cutler, D. M., & Richardson, E. (1997). Measuring the health of the US population. *Brookings Papers on Economic Activity*, 217–282.

Cutler, D. M., & Richardson, E. (1998). The value of health: 1970-1990. *American Economic Review*, *88*(2), 97–100.

Diener, E., Emmons, R., Larsen, R., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment*, *49*(1), 71–75. http://doi.org/10.1207/s15327752jpa4901_13

Edfeldt, L., Strömbäck, K., Grendin, J., Bunne, M., Harder, H., Peebo, M., … Konradsson, K. (2014). Evaluation of cost-utility in middle ear implantation in the “Nordic School”: a multicenter study in Sweden and Norway. *Acta Oto-Laryngologica*, *134*(1), 19–25. http://doi.org/10.3109/00016489.2013.834459

Goorden, M., Muntingh, A., van Marwijk, H., Spinhoven, P., Adèr, H., van Balkom, A., … Hakkaart-van Roijen, L. (2014). Cost utility analysis of a collaborative stepped care intervention for panic and generalized anxiety disorders in primary care. *Journal of Psychosomatic Research*, *77*(1), 57–63. http://doi.org/10.1016/j.jpsychores.2014.04.005

Groot, W., & van den Brink, H. M. (2004). A direct method for estimating the compensating income variation for severe headache and migraine. *Social Science & Medicine*, *58*(2), 305–314. http://doi.org/10.1016/S0277-9536(03)00208-9

Groot, W., & van den Brink, H. M. (2006). The compensating income variation of cardiovascular disease. *Health Economics*, *15*(10), 1143–1148. http://doi.org/10.1002/hec.1116

Groot, W., van den Brink, H. T. M., & Plug, E. (2004). Money for health: the equivalent variation of cardiovascular diseases. *Health Economics*, *13*(9), 859–872. http://doi.org/10.1002/hec.867

Harris, C., Driver, B., & Mclaughlin, W. (1989). Improving the Contingent Valuation Method - a Psychological Perspective. *Journal of Environmental Economics and Management*, *17*(3), 213–229. http://doi.org/10.1016/0095-0696(89)90017-X

McNamee, P., & Mendolia, S. (2014). The effect of chronic pain on life satisfaction: Evidence from Australian data. *Social Science & Medicine*, *121*, 65–73. http://doi.org/10.1016/j.socscimed.2014.09.019

Morciano, M., Hancock, R., & Pudney, S. (2015). Disability Costs and Equivalence Scales in the Older Population in Great Britain. *Review of Income and Wealth*, *61*(3), 494–514. http://doi.org/10.1111/roiw.12108

Neumann, & Cohen. (n.d.). Cost-Effectiveness Analysis Registry. Retrieved from http://healtheconomics.tuftsmedicalcenter.org/cear4/Home.aspx

Powdthavee, N. (2005). Unhappiness and crime: Evidence from South Africa. *Economica*, *72*(287), 531–547. http://doi.org/10.1111/j.0013-0427.2005.00429.x

Powdthavee, N., & van den Berg, B. (2011). Putting different price tags on the same health condition: Re-evaluating the well-being valuation approach. *Journal of Health Economics*, *30*(5), 1032–1043. http://doi.org/10.1016/j.jhealeco.2011.06.001

Santos, C. (2013). Costs of Domestic Violence: A Life Satisfaction Approach. *Fiscal Studies*, *34*(3), 391–409. http://doi.org/10.1111/j.1475-5890.2013.12012.x

Schwander, B. (2014). Early health economic evaluation of the future potential of next generation artificial vision systems for treating blindness in Germany. *Health Economics Review*, *4*(1), 27. http://doi.org/10.1186/s13561-014-0027-1

Snedecor, S. J., Botteman, M. F., Bojke, C., Schaefer, K., Barry, N., & Pickard, A. S. (2009). Cost-effectiveness of eszopiclone for the treatment of adults with primary chronic insomnia. *Sleep*, *32*(6), 817–824.

Statistics Iceland. (2016). Retrieved August 6, 2016, from http://hagstofa.is/talnaefni/efnahagur/verdlag/visitala-neysluverds/

Vallejo-Torres, L., Castilla, I., González, N., Hunter, R., Serrano-Pérez, P., & Perestelo-Pérez, L. (2015). Cost-effectiveness of electroconvulsive therapy compared to repetitive transcranial magnetic stimulation for treatment-resistant severe depression: a decision model. *Psychological Medicine*, *45*(7), 1459–1470. http://doi.org/10.1017/S0033291714002554

Weinberg, D., Friedman, J., & Mayo, S. (1981). Intraurban Residential-Mobility - the Role of Transactions Costs, Market Imperfections, and Household Disequilibrium. *Journal of Urban Economics*, *9*(3), 332–348. http://doi.org/10.1016/0094-1190(81)90031-0

Zafari, Z., Lynd, L. D., FitzGerald, J. M., & Sadatsafavi, M. (2014). Economic and health effect of full adherence to controller therapy in adults with uncontrolled asthma: a simulation study. *The Journal of Allergy and Clinical Immunology*, *134*(4), 908–915.e3. http://doi.org/10.1016/j.jaci.2014.04.009

Appendix A
CIVs for happiness and SWL in ISK

Table A1. CIV monetary values for happiness and SWL in ISK

	Happiness (Full sample)		Happiness (Two waves)		Satisfaction with life (Two waves)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	N=14,428	N=13,787	N=8,645	N=8,259	N=8,601	N=8,118
Melancholy	5,470,392	36,170,029	56,130,581	1,583,000,000	158,814**	736,079
Worry	3,632,265	34,039,911	26,450,648	606,300,000	118,443**	494,865
Anxiety	1,694,314	8,869,136	13,720,355	152,900,000	110,690**	427,177
Lack of stamina	175,066*	460,579	631,521	3,492,656	49,787***	144,138
Sleep difficulty	156,358*	454,614	499,820	2,265,642	32,850***	76,514*
Impaired phys. mobility	48,781**	91,182	183,399	524,238	25,551***	55,030*
Breathing difficulty	71,524**	170,754	143,752	593,030	22,345***	52,578*
Frequent headaches	43,563**	91,208	90,721	269,861	19,435***	43,239**
Abdominal pain	36,743***	74,963	78,776	242,312	17,934***	38,365**
Severe speech impedim.	33,078	56,023	52,191	120,612	16,438***	22,285
Severely low vision	23,475**	35,989	66,257	116,909	14,453	20,825**
Toothache	26,561**	57,306	28,033	73,208	10,980***	23,543**
Arm pain	19,715***	31,801**	34,195	66,516	10,737***	16,158***
Leg pain	18,634***	30,977**	32,581*	70,308	10,345***	18,502***
Severe hearing loss	9,523**	19,885*	9,962	19,810	9,231***	19,144*
Back or shoulder pain	16,771***	29,192**	29,687*	62,556	8,281***	14,167***
Menstrual pain	11,940***	21,103**	17,953*	43,293	7,615***	17,778**
Myositis	15,902***	27,673**	18,629*	35,388	7,330***	12,482***

Note: *** p<0.01, ** p<0.05, * p<0.10. Values are displayed in 1000 ISK at July 2016 price level.

Appendix B
Regression output examples

With 14 different model specifications and 18 health impairments under investigation 252 regressions were performed for this analysis. Below is a regression output for back/shoulder pain as an example One regression is shown for Model 1 and one for Model 2. In both examples is SWL the dependent variable and sample is 2007+2009.

MODEL 1:

```
Iteration 0:   log pseudolikelihood =   -1124773
Iteration 1:   log pseudolikelihood = -1101126.1
Iteration 2:   log pseudolikelihood = -1101123.5
Iteration 3:   log pseudolikelihood = -1101123.5

Ordered probit regression                       Number of obs   =       8601
                                                Wald chi2(15)   =     530.79
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -1101123.5               Pseudo R2       =     0.0210

                            (Std. Err. adjusted for 5322 clusters in Zrodun)
------------------------------------------------------------------------------
             |               Robust
          LS |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    backpain |  -.2485976   .0289644    -8.58   0.000    -.3053668   -.1918284
ln_eqhhincpi |   .2552614   .0295391     8.64   0.000     .1973657     .313157
         age |  -.0623959   .0064657    -9.65   0.000    -.0750686   -.0497233
        age2 |   .0006054   .0000641     9.45   0.000     .0004798     .000731
      female |   .1771012   .0318484     5.56   0.000     .1146794     .239523
     married |   .8239084   .0590037    13.96   0.000     .7082633    .9395535
      steady |   .4650418   .0783757     5.93   0.000     .3114282    .6186553
  cohabiting |   .6016662   .0615349     9.78   0.000     .4810601    .7222723
    divorced |   .1655797   .0790196     2.10   0.036     .0107041    .3204553
     widowed |   .4694759    .091281     5.14   0.000     .2905684    .6483834
       rural |  -.0752274   .0574179    -1.31   0.190    -.1877644    .0373095
      urban1 |    -.11232   .0592116    -1.90   0.058    -.2283726    .0037325
      urban2 |  -.1354642   .0394416    -3.43   0.001    -.2127683   -.0581601
    children |   .0435645   .0158345     2.75   0.006     .0125294    .0745996
        ar09 |  -.0173758   .0215597    -0.81   0.420    -.0596319    .0248804
-------------+----------------------------------------------------------------
       /cut1 |  -1.811644   .2736652                     -2.348018    -1.27527
       /cut2 |   -1.64146   .2694706                     -2.169613   -1.113308
       /cut3 |  -1.521511   .2670105                     -2.044842   -.9981803
       /cut4 |  -1.366686   .2669978                     -1.889993   -.8433803
       /cut5 |  -1.232074    .264057                     -1.749616    -.714532
       /cut6 |  -1.098092   .2645451                     -1.616591   -.5795931
       /cut7 |  -.9735789   .2649802                     -1.492931   -.4542273
       /cut8 |  -.8126235   .2651788                     -1.332364   -.2928826
       /cut9 |  -.7331384   .2651575                     -1.252838   -.2134392
      /cut10 |  -.6087981   .2654959                     -1.129161   -.0884357
      /cut11 |  -.4652219   .2655573                     -.9857047    .0552609
      /cut12 |  -.3501229   .2656251                     -.8707386    .1704928
      /cut13 |  -.1987617   .2651222                     -.7183917    .3208684
      /cut14 |  -.0650765    .265613                     -.5856684    .4555153
      /cut15 |   .0650861   .2661353                     -.4565296    .5867018
      /cut16 |   .2236845   .2669483                     -.2995245    .7468936
      /cut17 |   .3715515   .2668838                     -.1515312    .8946342
      /cut18 |   .5481291   .2669236                      .0249683     1.07129
      /cut19 |   .7247632   .2670882                      .2012799    1.248247
      /cut20 |   .9097393   .2669954                       .386438    1.433041
      /cut21 |   1.111141   .2674352                      .5869775    1.635304
      /cut22 |   1.282812   .2679279                      .7576829    1.807941
      /cut23 |    1.47007   .2680577                      .9446865    1.995453
      /cut24 |    1.66341   .2684693                       1.13722      2.1896
      /cut25 |   1.892385   .2688591                       1.36543    2.419339
      /cut26 |   2.164642   .2693796                      1.636668    2.692616
      /cut27 |   2.346046   .2694945                      1.817847    2.874246
      /cut28 |   2.556224   .2702608                      2.026523    3.085925
      /cut29 |   2.834056   .2700427                      2.304782     3.36333
      /cut30 |   3.085186   .2714498                      2.553155    3.617218
------------------------------------------------------------------------------
```

MODEL 2:

```
Iteration 0:   log pseudolikelihood = -1085619.9
Iteration 1:   log pseudolikelihood = -1057218.9
Iteration 2:   log pseudolikelihood = -1057212.7
Iteration 3:   log pseudolikelihood = -1057212.7

Ordered probit regression                       Number of obs   =       8232
                                                Wald chi2(21)   =     627.24
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -1057212.7               Pseudo R2       =     0.0262

                                 (Std. Err. adjusted for 5213 clusters in Zrodun)
------------------------------------------------------------------------------
             |               Robust
          LS |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    backpain |  -.2368548   .0294809    -8.03   0.000    -.2946363   -.1790733
 ln_eqhhincpi |   .1767361   .0308178     5.73   0.000     .1163343     .237138
         age |   -.077802   .0070238   -11.08   0.000    -.0915684   -.0640355
        age2 |    .000785   .0000721    10.88   0.000     .0006436    .0009264
      female |   .1994316   .0334739     5.96   0.000     .1338239    .2650392
     married |    .792201     .05962    13.29   0.000     .6753479    .9090541
      steady |   .4184716   .0775246     5.40   0.000     .2665261    .5704171
   cohabiting |   .5745859   .0618616     9.29   0.000     .4533395    .6958324
    divorced |   .1249344   .0798416     1.56   0.118    -.0315522     .281421
     widowed |   .4423537   .0952754     4.64   0.000     .2556174    .6290901
       rural |  -.0169285   .0563015    -0.30   0.764    -.1272774    .0934204
      urban1 |  -.0339234   .0598546    -0.57   0.571    -.1512363    .0833896
      urban2 |  -.0866383   .0405341    -2.14   0.033    -.1660837   -.0071929
    children |   .0256024   .0161759     1.58   0.113    -.0061017    .0573065
        ar09 |   -.058889   .0240593    -2.45   0.014    -.1060443   -.0117336
    edgroup2 |   .2876227   .0614102     4.68   0.000     .1672609    .4079845
    edgroup3 |   .1266809   .0379122     3.34   0.001     .0523743    .2009875
    edgroup4 |   .3074664   .0458304     6.71   0.000     .2176404    .3972923
    edgroup5 |   .4187567   .0613662     6.82   0.000     .2984812    .5390323
unemployed_gen |  -.6568896   .0962192    -6.83   0.000    -.8454758   -.4683034
outof_labourforce |  -.1826211    .048072    -3.80   0.000    -.2768404   -.0884017
-------------+----------------------------------------------------------------
       /cut1 |  -2.752621   .3010779                      -3.342723   -2.162519
       /cut2 |  -2.572726   .2959102                       -3.1527   -1.992753
       /cut3 |    -2.4631   .2929741                      -3.037318   -1.888881
       /cut4 |   -2.29853   .2919327                      -2.870708   -1.726352
       /cut5 |  -2.159043   .2885104                      -2.724513   -1.593573
       /cut6 |  -2.032552     .28855                        -2.5981   -1.467004
       /cut7 |  -1.908376   .2882771                      -2.473389   -1.343364
       /cut8 |  -1.743727   .2889081                      -2.309976   -1.177478
       /cut9 |   -1.65747   .2889056                      -2.223714   -1.091225
      /cut10 |  -1.526962   .2881667                      -2.091759   -.9621659
      /cut11 |  -1.373205   .2881174                      -1.937905   -.8085055
      /cut12 |  -1.250922   .2883659                      -1.816109   -.6857353
      /cut13 |  -1.095137   .2879573                      -1.659523   -.5307508
      /cut14 |   -.960106   .2884762                      -1.525509    -.394703
      /cut15 |   -.825194   .2891316                      -1.391882   -.2585064
      /cut16 |  -.6639779   .2900176                      -1.232402   -.0955538
      /cut17 |  -.5145178   .2897963                      -1.082508    .0534726
      /cut18 |   -.331372   .2896088                      -.8989948    .2362507
      /cut19 |  -.1484249    .289654                      -.7161363    .4192865
      /cut20 |   .0417523    .289498                      -.5256533    .6091579
      /cut21 |   .2455709   .2898262                      -.3224781    .8136198
      /cut22 |    .420793   .2902326                      -.1480525    .9896385
      /cut23 |    .611463    .290242                       .042599    1.180327
      /cut24 |   .8094626   .2904816                       .2401292    1.378796
      /cut25 |   1.040084   .2908812                       .4699677    1.610201
      /cut26 |   1.317288   .2912532                       .7464422    1.888134
      /cut27 |   1.502114   .2913598                       .9310597    2.073169
      /cut28 |   1.716956   .2923274                       1.144005    2.289907
      /cut29 |   1.998971   .2925672                        1.42555    2.572392
      /cut30 |   2.253601    .293844                       1.677678    2.829525
------------------------------------------------------------------------------
```

Appendix C
ESs and CIVs (ISK) by gender and year

Table C1. ES sorted by gender and year (2007 and 2009). Model 1 is used with SWL as the dependent variable.

	2007		2009		2007 + 2009	
	Males	Females	Males	Females	Males	Females
	N=2,437	N=2,608	N=1,695	N=1,861	N=4,132	N=4,469
Melancholy	46.36	30.74*	33.75	17.23*	43.07	22.84**
Worry	28.44	24.16	23.70	16.03	27.91	19.29**
Anxiety	25.22	20.32*	22.19	17.86	24.96	18.82**
Lack of stamina	16.71	7.10***	16.42	7.10**	17.59	7.11***
Sleep difficulty	10.09*	5.72***	9.35	6.12**	9.96*	5.87***
Impaired phys. mobility	9.68	4.69***	7.80	4.22***	9.36*	4.40***
Breathing difficulty	4.59*	4.59***	9.69	4.03**	6.51*	4.37***
Frequent headaches	4.11**	3.03***	21.74	3.42***	9.10*	3.21***
Abdominal pain	4.56**	4.04***	5.23	3.44***	5.12*	3.74***
Severe speech impedim.	17.95	1.51	0.17	19.99	3.24	5.21
Severely low vision	3.63*	4.47**	3.37	3.60*	3.66*	3.88***
Toothache	1.64**	8.64**	1.26	4.05**	1.49**	5.88***
Arm pain	2.55***	3.26***	3.17*	2.95***	2.92	3.09***
Leg pain	2.84***	2.89***	2.86*	3.18***	2.93	3.04***
Severe hearing loss	3.11	2.61**	2.18	3.11**	2.73*	2.87***
Back or shoulder pain	2.36***	2.49***	2.63**	2.85***	2.53***	2.67***
Menstrual pain	1.00***	1.92***	1.00***	2.67***	1.00***	2.23***
Myositis	3.03***	2.01***	2.39**	2.35***	2.82***	2.17***

Note: *** p<0.01, ** p<0.05, * p<0.10. Model 1 is used with SWL as the dependent variable. Ordering of the health conditions is kept the same as in previous tables, thus not entirely in descending order.

Table C2. CIV (1000 ISK) sorted by gender and year.

	2007		2009		2007+2009	
	Males	Females	Males	Females	Males	Females
	N=2,437	N=2,608	N=1,695	N=1,861	N=2,437	N=2,608
Melancholy	227,884	149,408*	164,544	81,560*	211,358	109,746**
Worry	137,844	116,383	114,032	75,527	135,231	91,890**
Anxiety	121,673	97,076*	106,457	84,688	120,408	89,549**
Lack of stamina	78,934	30,655***	77,490	30,626**	83,336	30,694***
Sleep difficulty	45,675*	23,709***	41,935	25,744**	45,010*	24,444***
Impaired phys. mobility	43,614	18,563***	34,185	16,173***	41,984*	17,087***
Breathing difficulty	18,045*	18,016***	43,684	15,220**	27,679*	16,956***
Frequent headaches	15,627**	10,220***	104,227	12,175***	40,688	11,103***
Abdominal pain	17,862**	15,288***	21,237	12,235***	20,680*	13,782***
Severe speech impedim.	85,140	2,587	-4,175	95,404	11,266	21,135
Severely low vision	13,197*	17,439**	11,924	13,056*	13,344*	14,492***
Toothache	3,224**	38,400**	1,284	15,334**	2,439**	24,520***
Arm pain	7,773***	11,371***	10,923*	9,807***	9,627	10,508***
Leg pain	9,243***	9,482***	9,352*	10,937***	9,716	10,271***
Severe hearing loss	10,591	8,098**	5,933	10,606**	8,699*	9,380***
Back or shoulder pain	6,815***	7,479***	8,199**	9,295***	7,698***	8,404***
Menstrual pain	0***	4,632***	0***	8,392***	0***	6,194***
Myositis	10,223***	5,093***	6,979**	6,801***	9,149***	5,858***

Note: *** p<0.01, ** p<0.05, * p<0.10. Amount is displayed in 1000 ISK. Model 1 is used with SWL as the dependent variable. Ordering of the health conditions is kept the same as in previous tables, thus not entirely in descending order.

Appendix D
QoLWs, ESs and CIVs difference between 2007 and 2009

Additional regressions were performed in order to investigate whether the results would differ between the samples from 2007 and 2009 since the Icelandic (and world-wide) economy changed a lot with the recession in 2008 (CPI went up 27%, unemployment went from 1,9% to 6,7%, and thus income went down). Satisfaction with life was chosen as the proxy for wellbeing in this analysis. There is some difference between 2007 and 2009 for example for headaches and menstrual pain. Mental illnesses are also valued lower in 2009 than 2007.

Table D1. QoLWs, Ess and CIVs sorted by year.

	QoLW		ES		CIV USD	
	2007	2009	2007	2009	2007	2009
	N=5,045	N=3,556	N=5,045	N=3,556	N=5,045	N=3,556
Melancholy	0.837***	0.835***	40.25*	25.47*	1,616,648*	1,007,572*
Worry	0.858***	0.858***	28.29*	20.92	1,123,937*	820,267
Anxiety	0.858***	0.853***	24.12**	21.74*	952,212**	854,005*
Lack of stamina	0.893***	0.885***	10.55***	10.79**	393,345***	403,256**
Sleep difficulty	0.904***	0.894***	7.37***	7.55**	262,317***	269,951**
Impaired physical mobility	0.908***	0.907***	6.49***	5.63***	226,230***	190,808***
Breathing difficulty	0.922***	0.909***	4.79***	6.07**	156,018***	208,600**
Frequent headaches	0.937***	0.903***	3.55***	6.64**	104,945***	232,202**
Abdominal pain	0.927***	0.923***	4.50***	4.49**	144,086***	143,859**
Severe speech impediments	0.914***	0.944***	5.28	2.76	176,217	72,376
Severely low vision	0.928***	0.931***	4.08***	3.56*	126,784***	105,434*
Toothache	0.934***	0.948***	3.71***	2.64**	111,575***	67,675**
Arm pain	0.945***	0.938***	2.97***	3.23***	81,038***	91,671***
Leg pain	0.947***	0.939***	2.89***	3.19***	77,670***	90,149***
Severe hearing loss	0.945***	0.945***	2.88***	2.72**	77,331***	70,980**
Back or shoulder pain	0.956***	0.943***	2.39***	2.87***	57,356***	77,035***
Menstrual pain	0.966***	0.933***	1.93***	3.53***	38,119***	104,193***
Myositis	0.957***	0.951***	2.36***	2.51***	55,976***	62,069***

Note: *** p<0.01, ** p<0.05, * p<0.10. Model 1 is used with SWL as the dependent variable. For menstrual pain female only sample is used.