EEPRU

Policy Research Unit in Economic Evaluation of Health and Social Care Interventions

Research Report

# Title Examining productivity losses associated with health related quality of life using patient and general population data.


Authors Ara R, Kearns, Mukuria C, van Hout B, Brazier J.

Correspondence to: Roberta Ara, HEDS, ScHARR, Regent Court, 30 Regent Street, Sheffield, S1 4DA. Email: r.m.ara@sheffield.ac.uk



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# 1. BACKGROUND

Economic evaluation is used to inform decisions related to setting priorities in health care and whether health care interventions should be reimbursed by combining information on costs with benefits. The key focus when assessing the benefits from health care interventions is health which may be assessed in natural units such as life years saved or quality adjusted life years (QALY) for use in cost effectiveness and cost utility analysis respectively. QALYs focus on the health related quality of life (HRQoL) associated with different health states which are valued by members of the general public. Costs are the direct costs of providing health care but indirect costs (not funded directly through the health care system), which result from having poor health may also be included. Indirect costs include productivity losses which refer to costs associated with time off paid and unpaid work due to illness.

Measuring the productivity losses associated with specific health conditions has typically focused on self-reported or objective data on time off work (Zhang *et al*.2011). A different approach relies on estimating productivity directly from the health states. This allows productivity losses associated with different health states to be predicted where this information is not available. In order to assess the relationship between productivity and health, patient datasets containing information on health related quality of life (HRQoL) on a wide range of conditions measured using accepted HRQoL measures (such as EQ-5D) alongside productivity information are required. This would allow productivity losses, for example days off work, to be linked to particular health states described by these HRQoL measures. In addition to patient data, the recall period for the HRQoL measures should match the recall period of the productivity losses to minimise bias associated with mismatch due to different recall periods. For example, the recall period in the EQ-5D is today whereas measures of productivity such as the Health and Labour Questionnaire (van Roijen *et al*.1996) use a two-week recall period. Larger studies focusing on productivity tend to ask respondents to consider longer periods such as four weeks, three (six or twelve) months (Zhang *et al*.2011). Linking longer productivity losses to current HRQoL may either overestimate or underestimate the effect of conditions.

This aggregate approach of estimating productivity has been used by Krol *et al*.(2013) using Dutch general public data, and Rowen *et al*.(2013) using UK patient data. Krol et al.(2013) used the EQ-5D and hypothetical time off work estimated by the respondents to develop their model. Rowen *et al*.(2013) used EQ-5D, International Classification of Diseases (ICD 10) codes and self-reported days of work to develop models to predict productivity losses. Models from Rowen *et al*.(2013) are applicable in the UK setting as they use the recommended heatlh technology assessment measure, the EQ-5D, and have clinical diagnosis data based on ICD which is used by the Department of Health in the UK. However, Rowen *et al*.(2013) identified a number of limitations which may limit applicability of their research.

The patient dataset that was used represents individuals who had recently been hospitalised and on average, these patients are likely to be sicker than the typical patient treated by the National Health Service (NHS) in the UK. Sicker respondents are likely to have higher productivity losses and models derived from these data would overestimate the productivity effects in typical patients. There were also concerns that different recall periods were used for the HRQoL measure (EQ-5D) and the number of days off work. The EQ-5D recall period was today while productivity information related to the previous 6 weeks. Some individuals who reported full health (EQ-5D=1) also reported having a large number of days off work and this may have been a result of the mismatch in recall periods.

The work described in this report was commissioned by the Department of Health to inform its work on Value-Based-Pricing (VBP) (Department of Health, 2010), which is due to replace the current Pharmaceutical Pricing Regulation Scheme (PPS) in January 2014 for pricing medicines in the UK. VBP will include additional payments to interventions that are deemed to provide benefit that is of greater social value instead of the current narrow focus on outcomes relevant to the NHS and Personal Social Services (PSS). This requires taking into account wider societal benefits of medicines beyond the health of the patient including productivity.

### 1.1 Objective

The objective of the analyses was to provide a model to predict productivity losses associated with paid work that were representative of all patients that are likely to be seen in the NHS.

## 2. METHODS

In order to avoid some of the limitiaions in the existing UK analyses described earlier, an existing dataset with both HRQoL and productivity information with similar recall periods was required. The dataset also needed to be representative of typical patients seen by the NHS, and provide both EQ-5D data and ICD codes. No datasets were available which satisfied all these criteria. Two datasets which partially satisfied the requirements were identified and data from both datasets were used to fill the gaps in the other dataset.

The first dataset was the Health Outcomes Data Repository (HODaR), the patient dataset used by

Rowen et al.(2013). The second dataset was a general population dataset, Understanding Society (US). HODaR provided HRQoL data (both EQ-5D and SF-36), ICD codes, and information on productivity, but had the limitations identified above relating to generalisability and recall periods. US contained information on HRQoL based on the SF12 (but not EQ-5D), productivity information based on whether or not someone had time off work sick (but not the actual number of days), and self-reported health conditions (but not ICD codes). HODaR was used to develop mapping models to predict the SF12 from the EQ-5D, and models to predict the number of days of work. US was used to determine the probability of absence from paid work due to ill health. The methods section describes the data and methods of analysis in more detail.

## 2.1 Data

### 2.1.1 The Health Outcomes Data Repository

The Health Outcomes Data Repository (HODaR), is a dataset collated by Cardiff Research Consortium (Currie et al.2005). The data are collected using a prospective survey of recently discharged (within previous 6 weeks) inpatients and outpatients at Cardiff and Vale NHS Hospitals Trust, which is a large University hospital in South Wales, UK. The survey is linked to existing routine hospital health data to provide a dataset with socio-demographic, HRQoL and ICD classification data. The survey includes all subjects aged 18 years or older and excludes individuals who are known to have died. The survey also excludes people with a primary diagnosis on admission of a psychological illness or learning disability. The sample used in the current analyses is from inpatients and provides 96,282 eligible observations across 66,113 individuals discharged from hospital between April 2002 and January 2009. A total of 35,126 patients have a primary diagnosis (ICD-10 code) and provide a full set of responses for HRQoL, age and gender.

### 2.1.2 Understanding Society

Understanding Society (US), is an annual longitudinal study of 40,000 randomly selected households in the UK. The study was designed to capture social and economic information and attitudes of the respondents. The survey includes HRQoL information (measured using the SF12 instrument) and questions relating to employment. Current health status is self-reported and categorised into 9 broadly defined condition areas. The data used in the current analyses were collected during Wave 1 which covers the years 2009 and 2010 inclusively. Respondents were excluded if they were proxy respondents (n=3,262), aged 66 years or older (n=8,609), or if they had missing SF12 data (n=238). This gave a dataset of 26,658 individuals, of which 25% had a self-reported health condition. The five most common conditions were asthma (8.97%), high blood pressure (7.41%), arthritis (6.26%), diabetes (2.75%) and clinical depression (2.58%).

## 2.2 Measures

### 2.2.1 Demographs

Information on age and gender was available in both datasets. Age and gender may be related to both health status and productivity.

### 2.2.2 Conditions

The International Classification of Diseases (ICD) is the standard method for classifying diseases and other health problems. The 10th version (ICD-10) (http://www.who.int/classifications/icd/en/) was recorded for patients in HODaR. ICD classifications were recorded in the hospital data as primary diagnosis (reason for admission) as well as for secondary diagnosis and these were linked to the HODaR survey data. Consequently, diagnosis was clinically determined in the HODaR data. In the US data, respondents self-reported health conditions from a list limited to 9 very broadly defined prevalent conditions.

The HODaR data were sub-grouped according to ICD categories, taking into account the DH requirements (i.e. disaggregation for ICD-10 chapters C, E, G, I, J & M where possible), the broad programme budget categories (PBC) sub-groups used in recent research on the NICE cost-effectiveness threshold (Appendix 1 Table A1.1), and the sizes of the resulting sub-groups (sub-group size ≥ 100). The final sub-groups used in the regressions are provided in Appendix 1 Table A1.2.

### 2.2.3 Health related quality of life

EQ-5D: The EQ-5D (collected in HODaR) consists of 5 questions describing different dimensions of health (Mobility, Self Care, Usual Activities, Pain, Anxiety/depression). With three possible responses to each question this produces a maximum of 243 (5^3) unique health states. Using weights elicited from a sample of the UK general population, the accompanying preference-based index (range -0.59 to 1) is anchored at 1 for full health and 0 for death with negative values representing health states considered worse than death (Dolan 1997). The EQ-5D is the recommended HRQoL measure for health technology assessment (HTA) in England and was the required measure for the current project.

SF-36/SF12: The SF-36 was collected in HODaR while the SF12 was collected in US data. The SF-36 is a generic measure of HRQoL with 36 questions. Responses to these are used to generate two summary scores (mental component score (MCS), physical component score (PCS)). The SF12 is a shorter version of the SF-36 consisting of 12 of the 36 questions in the original measure. There is a slight variation in the wording of two of the 12 questions but these are unlikely to elicit different responses. Both the SF-36 and SF12 can be used to generate the SF-6D, a health state classification system with 6 dimensions (Physical, Role, Social, Pain, Mental, Vital). The dimensions have 4-6 health states each and have been valued by a representative sample in the UK population using standard gamble to generate a preference-based index with values ranging from 0.34 to 1 (Brazier 2003).

### 2.2.4 Productivity Loss

Single item questions were used to record responses related to days off work in both HODaR and US. In HODaR, respondents reported the actual number of days off work during the previous six weeks. In US, respondents were defined as being off work sick in the previous week if their stated reason for being off work was "sick/injured". It should be noted that respondents were only able to state one reason for being off work in the previous week. Hence if respondents were sick/injured, but already off work due to (say) maternity leave or holiday, then they may not have responded as being off work sick.

In addition to productivity information, information on employment status was also required. In HODaR, employment status was reported and this included past employment for those who had retired. As productivity losses from work only relate to those who are employed, using the whole sample would likely overestimate the work productivity losses associated with poor health. To test whether this was the case, a smaller sample of individuals who were aged below 66 and were not recorded as 'never worked/unemployed/in full time education' was used to represent those who were likely to be employed at the time they completed the survey. In US, respondents were defined as being in paid work in the previous week if they answered 'yes' to either of the following questions: 'did paid work last week' or 'no work last week but have paid job'.

### 2.2.5 Summary overview of datasets

Patients in the HODaR database are sent a questionnaire within 6 weeks of discharge from hospital. While some of the patients who receive the questionnaire will presumably have recovered from the acute effects of the health condition for which they were hospitalised, it is reasonable to assume that there will be a degree of random variation in recovery time and patients who receive the questionnaire relatively soon after discharge will certainly be in the post-hospital recovery stage. Suffice to say, as all the respondents have recently been hospitalised, the effects of any relationships between EQ-5D scores and time off work identified in these data may not generalise to patients who have not been hospitalised recently. Conversely, respondents in the US database are sampled from the general population which includes respondents with prevalent health conditions who have not been hospitalised recently and thus this sample is more representative of the population of interest. HRQoL in HODaR is captured using the EQ-5D and the SF-36, whereas HRQoL in US is captured using the SF12 questionnaire. In addition, the differences in the recall period for the EQ-5D (1 day) and the time off work sick (6 weeks) in the HODaR questionnaire means that these data are unlikely to provide a strong relationship between these variables. Conversely, the recall periods used in US for the SF12 (previous 4 weeks) and time off work sick (previous 1 week) are more likely to show a relationship between HRQoL and absence from work due to ill health. Presence of health conditions in HODaR are indicated by clinically noted ICD-10 codes whereas health conditions in US are self-reported and limited to 9 very broadly defined conditions.

# 3. ANALYSIS

## 3.1 Analysis overview

The relationship between EQ-5D and absence from work due to ill health was explored using the following method:

Step 1: the HODaR and US data were compared using descriptive statistics

Step 2: a relationship between EQ-5D and SF12 (controlling for age, gender and ICD category) was derived from the HODaR data

Step 3: a relationship between SF12 and absence from work due to ill health (controlling for age and gender) was derived from the US data

Step 4: a relationship to predict the number of days off work, given off work due to ill health, (controlling for age, gender and ICD categories) was derived from the HODaR data

Step 5: the models obtained in Steps 2-4 were used to determine the number of days off work due to sickness by EQ-5D and ICD category.

An alternative approach was also used to capture productivity losses, whereby employment was used (as opposed to absence from paid employment due to ill health) in Step 3 above.

## 3.2 Descriptive statistics

The HODaR and US descriptive statistics were compared in order to determine how representative the HODaR data was. Comparisons were based on age and HRQoL sub-groups. The self-reported health conditions in the US were “matched” to the ICD codes in HODaR using 9 sub-groups

(Appendix 2 Table A2.1) to enable more detailed comparison. The results of these analysis helped inform the subsequent mapping analysis.

### 3.3 Exploring the relationship between EQ-5D and SF12 (HODaR data)

A number of models and regression methods were used to explore possible relationships between the two HRQoL instruments including: two-step models combining logistic regressions for the extremes, with linear, logit and beta-regression for the other values; and ordered logistic models to predict responses for each of the SF12 six health dimensions. In addition, the effect of using the alternative measures available from both the SF12 (SF-6D preference index, MCS-12, PCS-12, responses to the six SF12 health dimensions), and the EQ-5D (EQ-5D preference index, responses to the EQ-5D health dimensions) were explored. The results presented here are linear models estimated using ordinary least squared (OLS):

Model 1:

$$\text{SF-6D} = \beta_0 + \beta\text{*Gender} + \beta\text{*Age/10} + \beta_i\text{*ICD group}_i + \ldots + \beta_n\text{*ICD group}_n + \beta_i\text{*EQ-5D dimension} + \ldots.. + \beta_n\text{*EQ-5D dimension} + \varepsilon \quad (1)$$

Model 2:

$$\text{PCS-12} = \beta_0 + \beta\text{*Gender} + \beta\text{*Age/10} + \beta_i\text{*ICD group}_i + \ldots + \beta_n\text{*ICD group}_n + \beta_i\text{*EQ-5D dimension} + \ldots.. + \beta_n\text{*EQ-5D dimension} + \varepsilon \quad (2)$$

Model 3:

$$\text{MCS-12} = \beta_0 + \beta\text{*Gender} + \beta\text{*Age/10} + \beta_i\text{*ICD group}_i + \ldots + \beta_n\text{*ICD group}_n + \beta_i\text{*EQ-5D dimension} + \ldots.. + \beta_n\text{*EQ-5D dimension} + \varepsilon \quad (3)$$

For all models, gender (female = 1) and ICD category were modelled as binary data, the EQ-5D health dimensions, and age were treated as continuous. Due to issues with the distribution of the EQ-5D preference-based scores, and based on results of exploratory analyses (not shown), the responses to the five EQ-5D questions were used as explanatory variables as opposed to the EQ-5D preference based index. There was concern as to how dimension levels would relate to the EQ-5D preference scores typically reported in HTA analysis. 223/243 health states have a unique EQ-5D preference-based score (i.e. the particular EQ-5D score can only be obtained from one specific combination of responses to the five questions) while for the remaining 10 EQ-5D preference based scores, each of these can be obtained from two different combinations of responses to the five questions. It is therefore possible to use dimensions in the predictions to map to a particular EQ-5D preference score. However, the use of the EQ-5D preference score as an explanatory variable as opposed to the EQ-5D dimensions was also explored.

### 3.4 Exploring the relationship between SF12 and absence from work (US data)

Multivariate logistic regression was performed to model the impact of the variables age, SF measure (either SF-6D or PCS_12 and MCS_12) and gender on the probability of being off-work sick. All of the covariates were continuous with the exception of gender. The possibility of non-linear relationships between the continuous variables and the probability of being off-work sick was explored using fractional polynomials. Briefly, each continuous variable was represented by a combination of polynomials (either one or two), where the powers for the polynomials are estimated from the data and taken from the set {-2, -1, -½, 0, ½, 1, 2, 3}, or the logarithm of the variable is selected. As there were no *a priori* interactions specified, none were considered.

The results of the fractional polynomial modelling indicated that age and SF-6D could be modelled as continuous variables, but the natural logarithm transformation of MCS_12 was required and PCS_12 should be modelled to the power -2. These transformations were applied, and the models re-estimated using logistic regression without centring or scaling any of the covariates (as occurs during fractional polynomial logistic regression).

### 3.5 Number of days off work given the probability of being off work (HODaR)

The number of days off work in HODaR is recorded as a discrete value (range 1 to 30), with a large spike at 30 days. Count and non-count data models allow these properties to be taken into account when modelling the data. A number of models were tested including Tobit models to take into account the bounded nature of the data; two part models to take into account the spike at 30 days; and truncated negative binomial models which are count data models and allow the lowest value to be a different value from zero.

The spike at 30 days could be generated by a different process to the rest of the days off work, or it could represent individuals who are different from the rest of the sample, for example, those who are sicker or who are on long-term sickness. A two-part model was used to model the data to allow for this. The first part used a probit model to predict the probability of having 30 days off work and the second part used a truncated negative binomial model for those who have less than 30 days off work. The two parts are combined using an expected value method.

Expected(Days off work) = Probability(30 days off work) + (Predicted days off work < 30)*
(1 – Probability(30 days off work))) (4)

Previous work indicated that there is over-dispersion in the HODaR days off work data (Rowen et al.2013). As a consequence, a zero truncated negative binomial model was fit using data from employed respondents under the age of 66. The zero truncated version was used to allow for the absence of zeros in the data. The models were used to predict the number of days off work and the final model was selected based on predictive performance across the ICD groups.

## 3.6 Combining the elements to predict time off work by EQ-5D and ICD

The elements described above were combined to predict the number of days off work sick as follows:

Step 2 (HODaR data) provides the expected SF* (SF-6D, or MCS, PCS) controlled for EQ-5D (dimension scores or preference index), age, gender and ICD category

$$E(SF^*) = f(\text{EQ-5D, age, gender, ICD category}) + \varepsilon \quad (5)$$

Step 3 (US data) provides the probability of being off work sick (OWS) controlled for a SF* (SF-6D, or MCS, PCS) score, age and gender

$$P(OWS) = f(SF^*, \text{age, gender}) + \varepsilon \quad (6)$$

Step 4 (HODaR data) provides the number of days off work sick (DOWS), given the probability of being OWS controlled for age, gender and ICD category

$$E(DOWS \mid OWS) = f(\text{age, gender, ICD category}) + \varepsilon \quad (7)$$

Combining the above provides the average (mean) number of days off work sick by EQ-5D, age, gender and ICD category:

$$E(DoWS) = f(\text{age, gender, ICD category}) \mid P(OWS).$$

As the steps involve probabilities relating to being off work sick, the estimated values cannot equal zero days.

## 3.7 Predicting productivity using employment data (US data)

In contrast to the previous analyses which measured productivity using the probability of being off work sick (US) and the number of days off work sick (HODaR), the analyses below examine productivity in terms of whether respondents indicated they did paid employment in the previous week in US data. Respondents were defined as being productive in the previous week if they answered ‘yes’ to the following question: ‘Did you do  paid work last week’.

As SF12 may be described using either the SF-6D preference index, or both the mental and physical component summary scores (MCS-12 and PCS-12), models were obtained to explore each of these relationships. Two different models were considered; one which included the log of SF-6D, and one which included PCS, $PCS^2$, MCS and $MCS^2$. Both models also included gender, age and $age^2$. Logistic regression was used to model the probability of being productive in the last week. The two models were of the form:

$$\text{Logit(productivity)} = \beta_0 + \beta^*\text{Age}/10 + \beta^*(\text{Age}/10)^2 + \beta^*\text{Gender} + \beta^*\text{Ln(SF-6D)} + \varepsilon \quad (8)$$

$$\text{Logit(productivity)} = \beta_0 + \beta^*\text{Age}/10 + \beta^*(\text{Age}/10)^2 + \beta^*\text{Gender} + \beta^*\text{PCS}/10 + \beta^*(\text{PCS}/10)^2 + \beta^*\text{MCS}/10 + \beta^*(\text{MCS}/10)^2 + \varepsilon \quad (9)$$

# 4. RESULTS

## 4.1 Descriptive statistics

All respondents in HODaR (n=35,126) have at least one condition (Table 1), while just a proportion (25%) of respondents in US data (n=25,658) indicate they have a condition (using the self-reported responses for the nine named prevalent conditions). On average, the respondents in HODaR are older (mean age 48 vs 40 years), have a lower HRQoL (mean SF-6D 0.689 vs 0.822), with greater problems on the SF12 MCS (mean 43.8 vs 53.0) and PCS (mean 47.8 vs 51.2) (Table 1 and Appendix 2 Figure A2.1).

**Table 1: Summary stats for HODaR and US datasets**

| | HODaR N=35,126 (all have at least one condition) | | Understanding Society N=25,658 (25% have a condition) | |
|---|---|---|---|---|
| | mean | sd | mean | sd |
| Age | 47.84 | 12.81 | 40.37 | 12.16 |
| SF-6D | 0.6889 | 0.1648 | 0.8223 | 0.1224 |
| MCS | 43.81 | 11.61 | 53.03 | 7.79 |
| PCS | 47.82 | 8.64 | 51.24 | 8.71 |
| | N | % | N | % |
| SFPhysical | | | | |
| Not limited | 17,314 | 49.29 | 23,413 | 91.25 |
| Limited a bit | 9,907 | 28.2 | 1,719 | 6.70 |
| Limited a lot | 7,905 | 22.5 | 526 | 2.05 |
| SFRole | | | | |
| No problems | 10,271 | 29.24 | 16,848 | 65.66 |
| Physical health | 7,816 | 22.25 | 2,862 | 11.15 |
| Emotional problems | 2,412 | 6.87 | 3,472 | 13.53 |
| Physical & emotional problems | 14,627 | 41.64 | 2,476 | 9.65 |
| SFSocial | | | | |
| Not limited | 12,752 | 36.3 | 19,795 | 77.15 |
| Limited a little | 5,841 | 16.63 | 2,994 | 11.67 |
| Limited some times | 8,475 | 24.13 | 1,969 | 7.67 |
| Limited most times | 5,351 | 15.23 | 673 | 2.62 |
| Limited all the time | 2,707 | 7.71 | 227 | 0.88 |
| SFPain | | | | |
| No interference | 12,047 | 34.30 | 17,470 | 68.09 |
| A little interference | 7,403 | 21.08 | 4,670 | 18.20 |
| Moderate interference | 5,781 | 16.46 | 1,622 | 6.32 |
| Interferes quite a bit | 6,608 | 18.81 | 1,260 | 4.91 |
| Extreme interference | 3,287 | 9.36 | 636 | 2.48 |
| SFMental | | | | |
| None of the time | 13,267 | 37.77 | 13,031 | 50.79 |
| A little of the time | 10,299 | 29.32 | 7,895 | 30.77 |
| some of the time | 7,046 | 20.06 | 3,653 | 14.24 |
| Most of the time | 3,058 | 8.71 | 878 | 3.42 |
| All of the time | 1,456 | 4.15 | 201 | 0.78 |
| SFVital | | | | |
| None of the time | 1,341 | 3.82 | 2,514 | 9.80 |
| A little of the time | 8,478 | 24.14 | 11,180 | 43.57 |
| some of the time | 9,760 | 27.79 | 8,347 | 32.53 |
| Most of the time | 7,181 | 20.44 | 2,679 | 10.44 |
| All of the time | 8,366 | 23.82 | 938 | 3.66 |

When comparing sub-groups of nine broadly defined health conditions in the two datasets, there are similar differences in general across the datasets in the characteristics of the sub-groups (Appendix 2, Table A2.2). However, there was some similarity when comparing means for the matched groups: thyroid, depressive illness, cancer (95% CI overlap for age); depressive illness, cancer (95% CI overlap for SF-6D); thyroid, liver, cancer (95% CI overlap for MCS_12); diabetes, thyroid, CHD, cancer (95% CI overlap for PCS_12) (see Appendix 2 for more details).

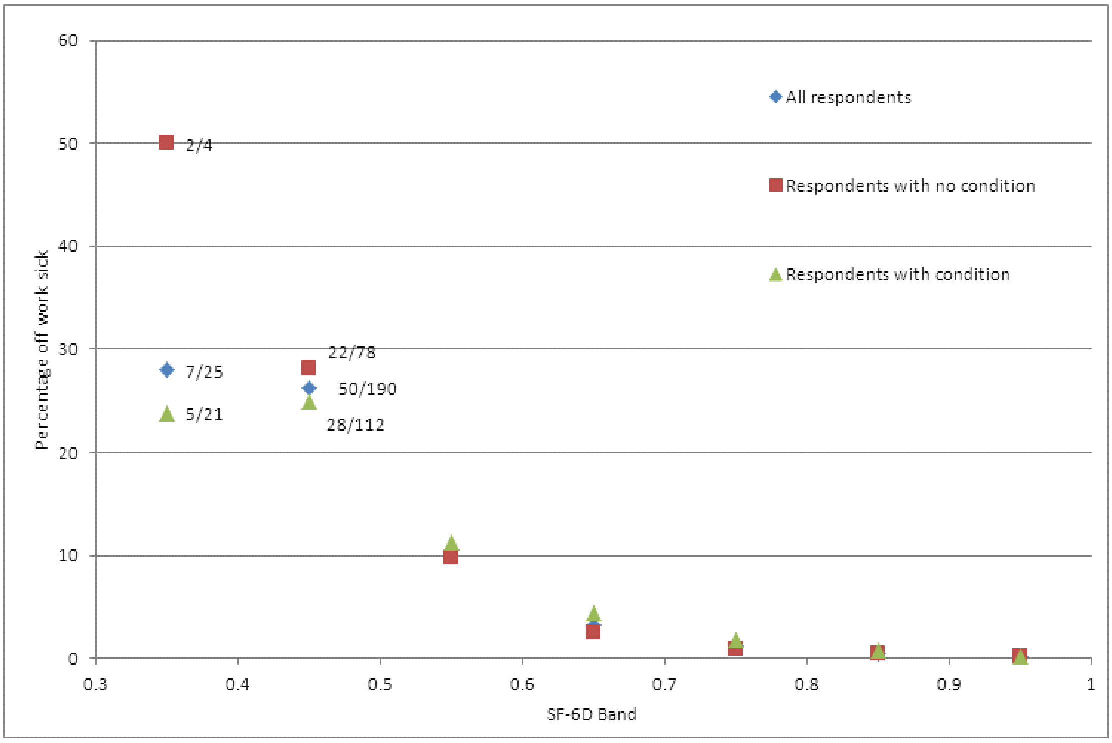
Comparing respondents who had time off work due to ill health in the previous week with those who did not in US, the mean SF-6D score was lower for those who had been off work than those who had not (mean SF-6D=0.62 vs. 0.83) irrespective of whether they indicated that they had a condition or not (Table 2). The percentage of respondents who had been off work was higher in those who indicated that they had a condition (192/6684=2.9%) than those who indicated they did not (192/18974=1.0%). Sub-grouping by SF-6D index, the numbers in Figure 1 represent the absolute number of respondents who reported they were off work sick. The percentage of respondents who indicated they were off sick increases as their HRQoL decreases, irrespective of whether they indicated they had a health condition or not. Very few respondents who indicate they had good HRQoL (SF-6D > 0.8) indicated they were off work sick in the previous week. When comparing the off work sick rates for respondents in the "poor" HRQoL bands (i.e. SF-6D < 0.5), the rate is higher for respondents who did not have one of the named conditions. However, these are very small numbers, and presumably, if their HRQoL was this low, it is reasonable to assume that they had a condition not identified in the US questionnaire. This provides an argument that if all conditions are not identified by the US questionnaire the full dataset should be used in the regressions, as opposed to just the respondents who indicate they had at least one of the named conditions.

**Table 2: Comparing US data (respondents with/without a condition)**

| | | Age | | SF-6D | | PCS | | MCS | |
|---|---|---|---|---|---|---|---|---|---|
| | N | mean | sd | mean | sd | mean | sd | mean | sd |
| **US (all)** | | | | | | | | | |
| Not off sick | 25,274 | 40.31 | 12.16 | 0.8253 | 0.12 | 53.24 | 7.49 | 51.35 | 8.55 |
| Off sick | 384 | 44.11 | 12.08 | 0.6243 | 0.13 | 39.18 | 13.26 | 43.84 | 12.08 |
| **US (With condition)** | | | | | | | | | |
| Not off sick | 6,492 | 45.52 | 11.98 | 0.7848 | 0.13 | 49.80 | 9.58 | 49.80 | 10.04 |
| Off sick | 192 | 47.64 | 10.99 | 0.6029 | 0.12 | 36.62 | 13.73 | 42.49 | 15.03 |
| **US (No condition)** | | | | | | | | | |
| Not off sick | 18,782 | 38.51 | 11.69 | 0.8393 | 0.11 | 54.43 | 6.18 | 51.89 | 7.90 |
| Off sick | 192 | 40.58 | 12.11 | 0.6458 | 0.14 | 41.74 | 12.28 | 45.20 | 13.48 |

384/26658 = 1.5% who indicate off work sick in previous week; 192/6684 = 2.9% who indicate off work sick in previous week; 192/18974 = 1.0% who indicate off work sick in previous week

**Figure 1: Off work sick by SF-6D band**




## 4.2 Results of regressions to predict the relationship between EQ-5D and SF12

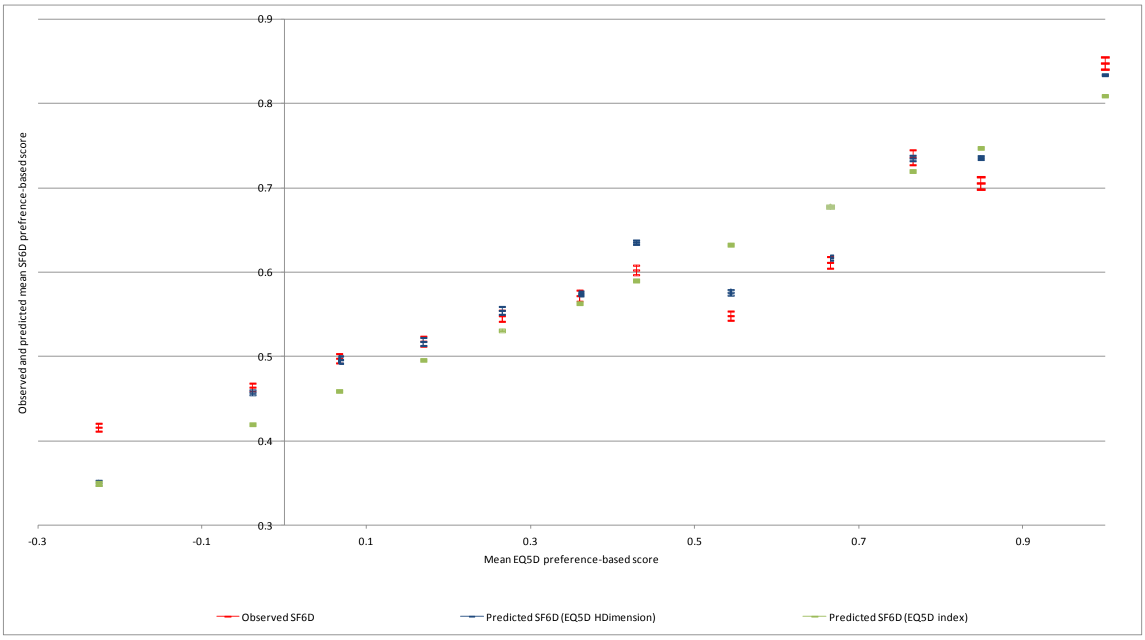
Using the EQ-5D dimensions as explanatory variables, the results of the SF-6D model show that the five EQ-5D dimensions all have the expected signs (as the level of problems increases, HRQoL measured using the SF-6D decreases), and are statistically significant ($p<0.001$) with the largest effect observed for the Anxiety/depression dimension (Appendix 3, Table A3.1). The effects of the health conditions (group1 to group56) are in general relatively small compared to the effects of the health dimensions and are statistically significant ($p<0.05$) in less than one third (17/56) of the categories. This is not unexpected as the effects on HRQoL are more appropriately described by the responses to the 5 health dimensions as these are more indicative of the SF12 score than the ICD group definitions. The results suggest that as age increases, HRQoL increases (Beta 0.005; $p<0.001$). This is counter-intuitive, as the majority of the literature shows HRQoL decreases by age. The effect is possibly confounded due to the inclusion of the EQ-5D health dimensions as the effects of age will likely be captured in these responses.

For the PCS model (Appendix 3, Table A3.1), with the exception of the dimension Anxiety/depression the effects for the other four health dimensions are statistically significant ($p< 0.001$) with Mobility and Usual activities having the largest effect. Conversely, for the MCS model, the effect for the dimension Mobility is relatively small compared to the other dimensions, and is not statistically significant (p=0.075). Not surprisingly the dimension Anxiety/depression has the largest effect (Beta -8.66). The models for the MCS and PCS scales follow a similar trend to the SF-6D model in terms of the relative magnitude of the effects for the health dimensions in comparison to the effects of the ICD categories (Groups 1 to 56) and the small number of these that are statistically significant.

All three models predict mean scores for SF-6D, MCS and PCS accurately when sub-grouping by the ICD categories (Appendix 3, Table A3.2) although there is reduced variation in the individual level predicted scores (data not shown). There is nothing to choose between the models in terms of accuracy in predicting mean scores. The final model choice (either SF-6D or the MCS_12 and PCS_12) will be informed by which of these variables (SF-6D or both MCS_12 and PCS_12) produce the most accurate results when used as explanatory variables to predict the probability of being off work sick in the US data.

The alternative models (which use the EQ-5D preference-based index as an explanatory variable) gave similar results for the ICD groups and age (Appendix 3, Table A3.3). The EQ-5D preference-based index has the expected positive effect (SF-6D increases as EQ-5D increases) and is statistically significant (p<0.001). Both models perform well in terms of mean SF-6D scores for categories (Appendix 3 Table A3.4) although there is reduced variation in the individual level predicted scores when using the EQ-5D preference-based index. However, when sub-grouping by actual EQ-5D preference-based scores (Appendix 3 Table A3.5, Figure 2), and plotting the corresponding observed and predicted mean SF-6D preference-based scores, the model using the EQ-5D five health dimensions as the explanatory variables outperforms the model using the EQ-5D preference-based scores, in the majority of the subgroups.

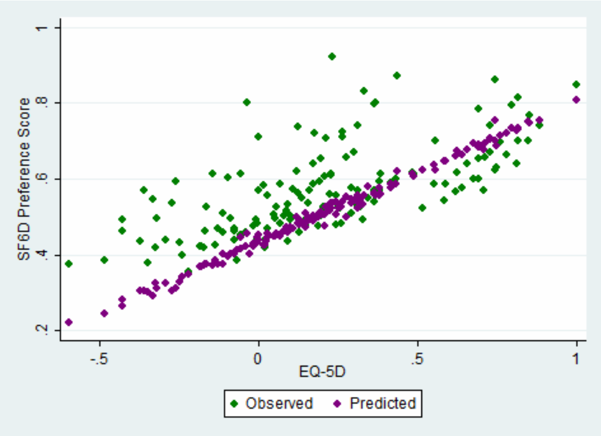
**Figure 2: Observed and predicted mean SF-6D scores sub-grouped by EQ-5D scores**



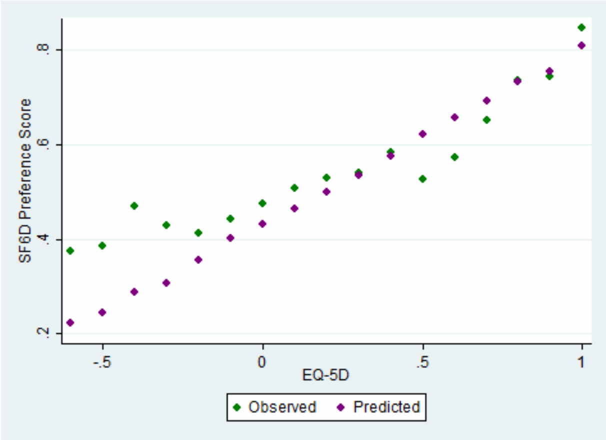

Graphical comparisons of observed and predicted values against EQ-5D value for each of these models are provided in Figure 3. For each outcome two graphs are displayed; one using the original EQ-5D values (of which there are 154 unique values), the other using broad EQ-5D values (calculated by rounding the original EQ-5D values to the nearest 0.1, resulting in 17 unique values). The figures indicate that for very low EQ-5D values (less than 0) the model over-predicts values for both SF-6D and PCS, but that the predictions for MCS appear reasonable. However, it should be noted that only a small proportion of the dataset has EQ-5D values less than 0 (7%, n = 2,427). Observed and predicted values were also compared for each of the three outcomes (SF-6D, PCS and MCS), for each ICD group, and for five sub-groups of EQ-5D values. These five subgroups were chosen to cover a roughly equal number of observations [less than 0.5 (n = 6,246); 0.5 ≤ to < 0.69 (n = 5,991); 0.69 ≤ to < 0.79 (n = 6,469); 0.79 <= to < 1 (n = 6,575); = 1 (n = 9,845)].

**Figure 3: Observed and predicted values against EQ-5D value**

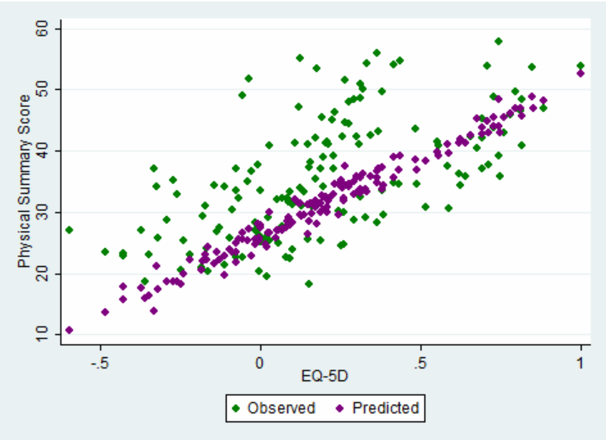
SF-6D; average observed vs expected by EQ-5D value



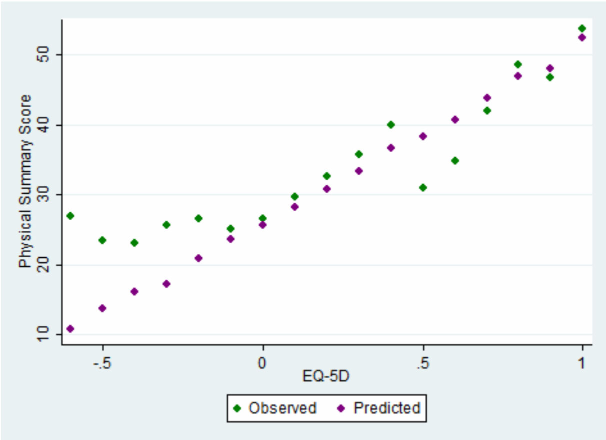

SF-6D; average observed vs expected by broad EQ-5D value



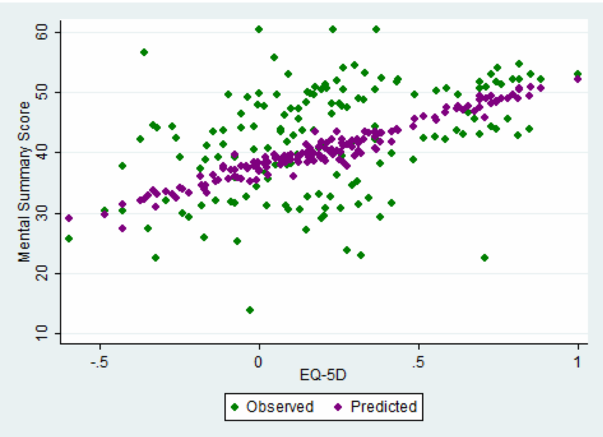

PCS; average observed vs expected by EQ-5D value



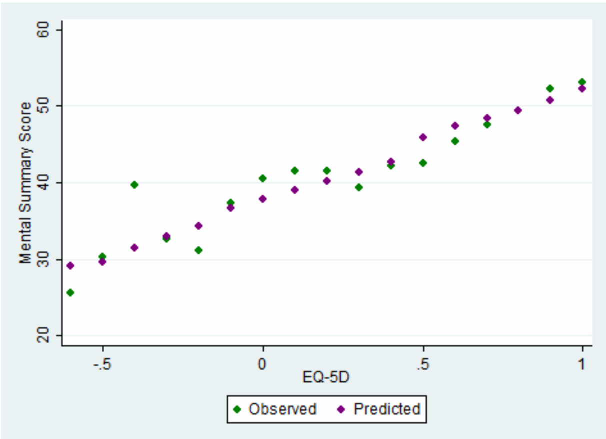

PCS; average observed vs expected by broad EQ-5D value




MCS; average observed vs expected by EQ-5D value




MCS; average observed vs expected by broad EQ-5D value




Results showed there was close agreement between observed and predicted values for each of the outcomes across all of the ICD groups and all of the EQ-5D subgroups.

## 4.3 Results of regressions to redict the probability of being off work sick

Table 3 provides the results for predicting probability of being off work with either SF-6D or MCS and PCS as explanatory variables. Coefficients for the SF12 variables show that the probability of being off work sick in the previous week increases with greater SF-6D or PCS_12 values, or lower MCS_12 values. The estimated effect of age is consistent for all four models, with each increase in age (by a year) increasing the log-odds of being off work sick in the previous week by 0.02. The effect for gender varies between positive and negative for the different models, but is highly not statistically significant for all of the models.

**Table 3: Regressions models to predict the probability of being off work sick in the previous week**

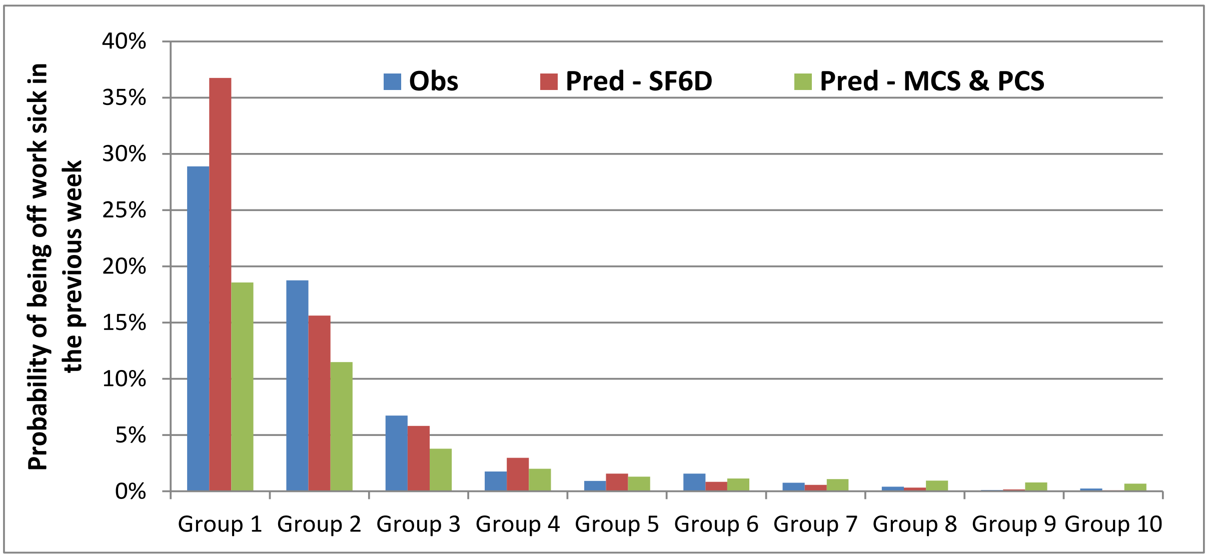
| | Model 4 | | Model 5 | | Model 6 | | Model 7 | |
|---|---|---|---|---|---|---|---|---|
| | Coef | P>z | Coef | P>z | Coef | P>z | Coef | P>z |
| | N=25533 (full dataset) | | | | N=6619 (respondents with a condition) | | | |
| Age | 0.02 | <0.001 | 0.02 | <0.001 | 0.02 | 0.003 | 0.02 | 0.007 |
| Female | -0.04 | 0.683 | 0.08 | 0.470 | -0.07 | 0.683 | 0.07 | 0.660 |
| SF-6D | -11.32 | <0.001 | NA | NA | -10.15 | <0.001 | NA | NA |
| PCS_12 | NA | NA | 8.11 | <0.001 | NA | NA | 6.04 | <0.001 |
| MCS_12 | NA | NA | -2.41 | <0.001 | NA | NA | -2.16 | <0.001 |
| Constant | 3.13 | <0.001 | -1.89 | <0.001 | 2.58 | <0.001 | -1.70 | <0.001 |
| | | | | | | | | |
| AUROC | 0.8684 | | 0.8684 | | | | | |
| Sensitivity | 0.52% | | 3.39% | | | | | |
| Specificity | 99.98% | | 99.91% | | | | | |
| Correctly classified | 98.49% | | 98.46% | | | | | |
| AIC | 3110.57 | | 3442.55 | | | | | |
| BIC | 3143.16 | | 3493.29 | | | | | |

N.B. values for PCS_12 and MCS_12 are both divided by 10. Additionally, the natural logarithm of MCS_12 is used, whilst PCS_12 is modelled to the power -2. All four continuous variables were modelled using fractional polynomials (up to 2 terms) to explore the possibility of non-linear relationships. AUROC: Area under the receiver operating characteristic curve. AIC: Akaike's information criteria. BIC: Bayesian information criteria.

Using the full dataset, there is a choice between using the model with SF-6D or the model with the two summary scores (PCS_12 and MCS_12). Summary measures comparing these two models show that there is little to choose between them; both models have area under the receiver operating characteristic curve (AUROC) values of 0.864, indicating excellent discrimination. The model with SF-6D has lower sensitivity (0.52% vs 3.39%), but slightly higher specificity (99.98% vs 99.91%). Overall however, the model with SF-6D is to be preferred as it has slightly better performance measures for the proportion correctly classified (98.49% vs 98.46%), and lower values for both of the information criteria (Akaike's information criteria (AIC): 3110.57 vs 3442.55, Bayesian information criteria (BIC): 3143.16 vs 3493.29).

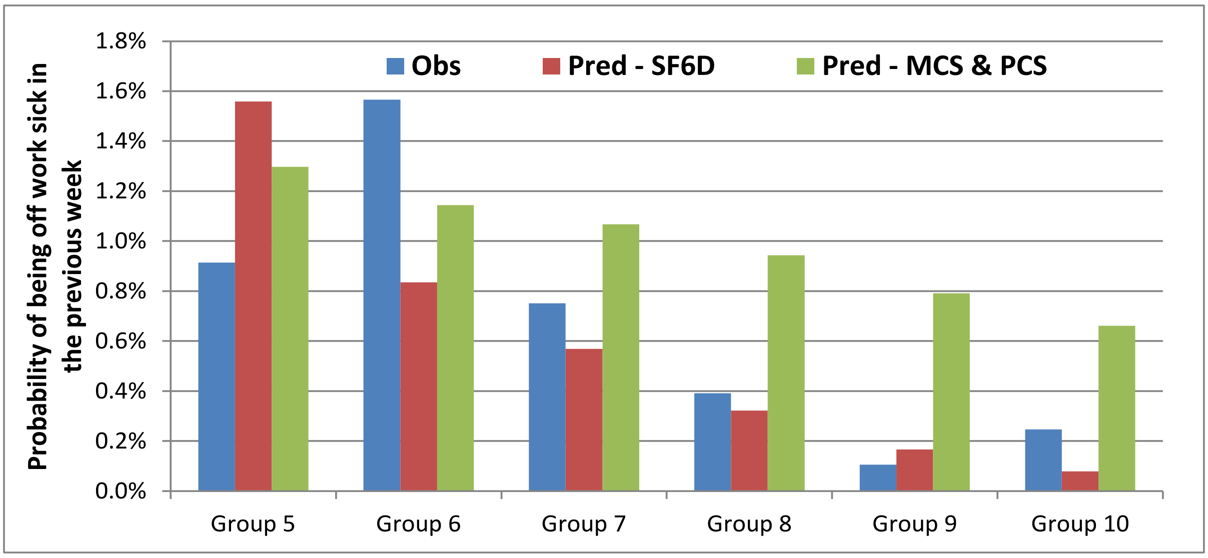
The two models were also compared by considering their predictions for different sub-groups, defined by their SF-6D value (Appendix 3, Table A3.6). The model including the explanatory variables MCS_12 and PCS_12 gives closer predictions for the 'medium' category, but for all the other categories the model including the explanatory variables SF-6D provides more accurate predictions. As quality of life decreases, the observed and predicted values show a substantial increase in the probability of being OWS in the previous week (Figure 4). Due to large differences in probabilities across the full SF-6D range, Figure 5 shows the results for Groups 5 to 10 on a different y-axis.

**Figure 4: Observed and predicted probabilities of absence from work in previous week by SF-6D**




NB: Pred – SF-6D are the predictions from the model which has SF-6D preference-based scores as an explanatory variable, Pred – MCS & PCS are the predictions from the model which has the SF12 summary scales as explanatory variables. (See Appendix 3, Table A3.6 for SF-6D groupings)

**Figure 5: Observed and predicted probabilities of absence from work (groups 5 to 10 only)**




NB: Data in Figure 5 are as used in Figure 4, the difference is the y-axis scale

## 4.4 Results of regressions exploring the number of days off work sick (HODaR)

Table 4 show the summary statistics of the observed and predicted days-off based on different modelling techniques. The two part model and truncated negative binomial predict the mean well but they underestimate the variance around the mean. When predicted days are grouped by ICD code groups, these models perform well (Table A3.7). However, the two part model missed one group (group 30) as those in this group all report less than 30 days off work which means part 1 of the model could not be estimated. The truncated negative binomial model is recommended to predict days off (Table A3.8). The main thing to note about this model is that it does not predict well on the lower range with a minimum value of 4.8 days compared to 1 day in the observed data. This is to be expected as the large peak at 30 days is pulling the distribution to the higher values.

**Table 4: Comparing observed and predicted days off work**

| Variable | Mean | Std. Dev. | Median | Minimum | Maximum |
|---|---|---|---|---|---|
| Observed | 17.6 | 12.05 | 20 | 1 | 30 |
| Predicted Tobit | 19.2 | 4.16 | 19 | 8.2 | 29.3 |
| Predicted two part model | 17.0 | 4.67 | 16 | 6.1 | 29.1 |
| Predicted truncated negative binomial | 17.1 | 4.62 | 16 | 4.8 | 31.4 |
| Predicted negative binomial | 8.2 | 4.05 | 7 | 1.0 | 35.6 |

## 4.5 Combining the results

The number of days of work is estimated as a function of EQ-5D score, age, gender and ICD code. Exemplars are provided in Table 5 and an excel spread sheet is available (separate file) which can be used to generate the probability of being off work sick, and the average number of days off work sick, given the probability of being off work sick for each age, gender, EQ-5D score and ICD category.

**Table 5: Exemplars for number of days of work sick by EQ-5D and ICD category**

| ICD group (ICD code) | EQ-5D score | Level (M,S,U,P,A) | Age (years) | Gender | P(OWS) | DOWS\|OWS |
|---|---|---|---|---|---|---|
| Group 51 (A04 ) | 1 | 11111 | 18 | M | 0.27% | 0.031 |
| Group 51 (A04) | -0.594 | 33333 | 18 | M | 67.74% | 7.712 |
| Group 51 (A04 ) | 1 | 11111 | 65 | M | 0.53% | 0.089 |
| Group 51 (A04) | -0.594 | 33333 | 65 | M | 80.21% | 13.43 |
| Group 14 (E29) | 1 | 11111 | 18 | M | 0.27% | 0.026 |
| Group 14 (E29) | -0.594 | 33333 | 18 | M | 67.12% | 6.623 |
| Group 14 (E29) | 1 | 11111 | 65 | M | 0.51% | 0.075 |
| Group 14 (E29) | -0.594 | 33333 | 65 | M | 79.76% | 11.58 |
| Group 04 (C50) | 1 | 11111 | 18 | F | 0.48% | 0.090 |
| Group 04 (C50) | -0.594 | 33333 | 18 | F | 78.67% | 14.660 |
| Group 04 (C50) | 1 | 11111 | 65 | F | 0.93% | 0.254 |
| Group 04 (C50) | -0.594 | 33333 | 65 | F | 87.69% | 24.037 |

## 4.6 Predicting productivity using employment data (US data)

### 4.6.1 Descrivitive analysis results

For this analysis, 61.7% (n = 23,989/38,871) of respondents were classified as being productive in the last week. Responses to the SF12 may be described by either the SF-6D preference-based score (observed range: 0.345 to 1) or by both the physical component summary (PCS) score (observed range: 11.39 to 66.13) and the mental component summary (MCS) score (observed range: 10.73 to 68.67). Summary statistics for these variables are presented in Table 6.

**Table 6: Summary statistics for the US data used for the alternative employment analysis**

| | | Age | | SF-6D | | PCS | | MCS | |
|---|---|---|---|---|---|---|---|---|---|
| | N | Mean | S.Dev. | Mean | S.Dev. | Mean | S.Dev. | Mean | S.Dev. |
| Full dataset | 38,871 | 39.81 | 13.56 | 0.7984 | 0.14 | 51.30 | 10.11 | 50.11 | 10.15 |
| Not productive | 14,882 | 39.05 | 15.66 | 0.7542 | 0.16 | 48.08 | 12.65 | 48.01 | 11.94 |
| Productive | 23,989 | 40.29 | 12.04 | 0.8257 | 0.12 | 53.29 | 7.49 | 51.42 | 8.60 |

Figure 6 shows the distributions of the SF12 variables considered for this analysis. Figure 6 shows the distribution of productivity by age, SF-6D, MCS and PCS (with Wald-based 95% confidence intervals). The figures are on the logit scale, as logistic regression assumes that the association between response and explanatory covariates is a straight-line on this scale. The figures suggest that linear functions are not likely to be good fits. For SF-6D taking the logarithm looks reasonable, for the remaining variables, use of a linear and a squared term appears reasonable. The graphs (with the possible exception of SF-6D) also suggest that separate models may be required for male and female genders. However, for consistency with existing work, gender is included in the models as a covariate.

**Figure 6: Distribution of SF12 measures**

SF-6D PCS MCS

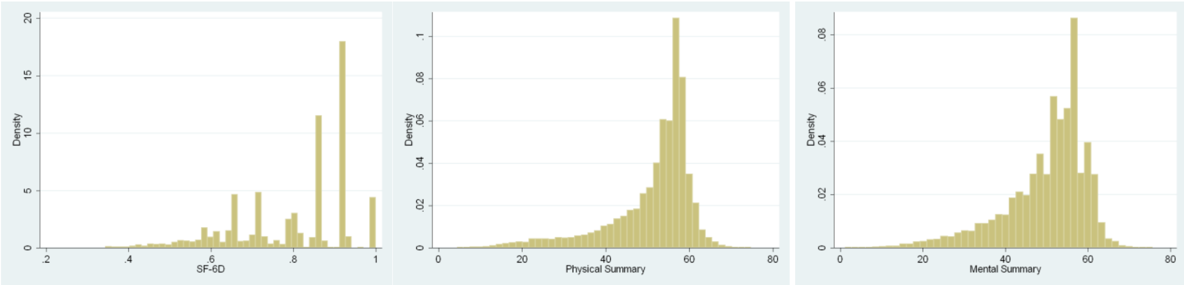
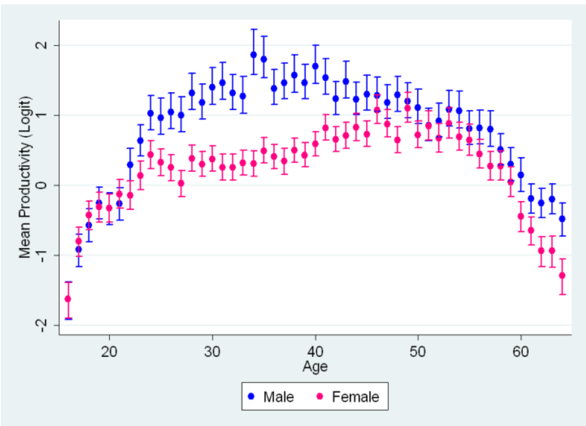
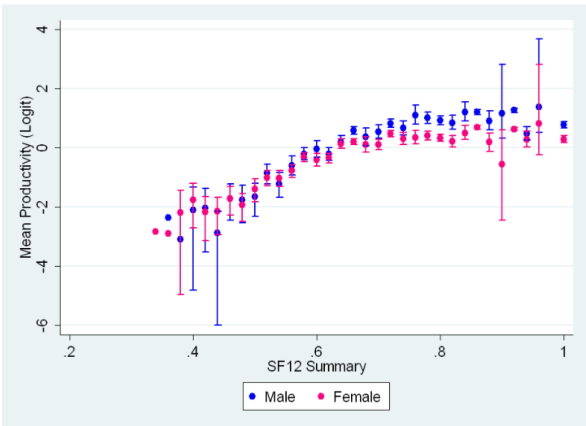



**Figure 7: Distibution of productivity by age, SF-6D, MCS and PCS**

Productivity in last week by age

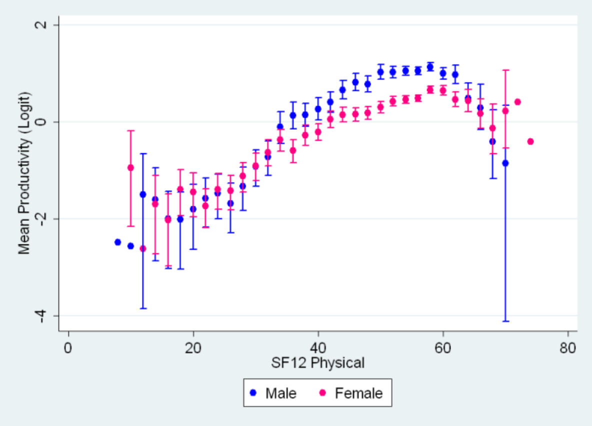


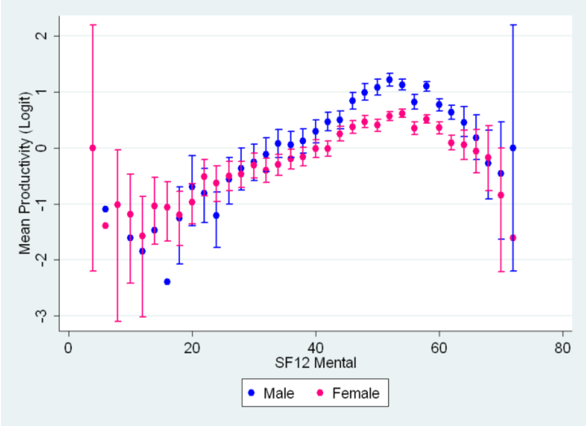

Productivity in last week by SF-6D




Productivity in last week by PCS

Productivity in last week by MCS




### 4.6.2 Results of regressions estimating employment

Model coefficients, 95% confidence intervals and p-values are summarised in Table 7. The summary goodness of fit values show that for all of the values considered, the PCS and MCS model shows better goodness of fit than the SF-6D model.

**Table 7: Model coefficients for the model predicting productivity using employment**

| | Model 1 (SF-6D) | | | Model 2 (PCS & MCS) | | |
|---|---|---|---|---|---|---|
| | Coef | 95% C.I. | P>z | Coef | 95% C.I. | P>z |
| Age | 3.04 | (2.93 to 3.14) | <0.001 | 3.00 | (2.90 to 3.11) | <0.001 |
| $Age^2$ | -0.36 | (-0.38 to -0.35) | <0.001 | -0.35 | (-0.37 to -0.34) | <0.001 |
| Female | -0.48 | (-0.53 to -0.44) | <0.001 | -0.5 | (-0.55 to -0.46) | <0.001 |
| Ln(SF-6D) | 3.1 | (2.98 to 3.22) | <0.001 | NA | NA | <0.001 |
| PCS | NA | NA | NA | 1.39 | (1.22 to 1.55) | <0.001 |
| $PCS^2$ | NA | NA | NA | -0.09 | (-0.11 to -0.07) | <0.001 |
| MCS2 | NA | NA | NA | 1.2 | (1.06 to 1.35) | <0.001 |
| $MCS^2$ | NA | NA | NA | -0.1 | (-0.11 to -0.08) | <0.001 |
| Constant | -3.59 | (-3.79 to -3.40) | <0.001 | -12.5 | (-13.01 to -11.99) | <0.001 |
| | | | | | | |
| AUROC | | 0.7356 | | | 0.7513 | |
| Sensitivity | | 84.70% | | | 86.06% | |
| Specificity | | 46.52% | | | 47.92% | |
| Correctly classified | | 70.08% | | | 71.45 | |
| AIC | | 45162.67 | | | 44038.39 | |
| BIC | | 45205.51 | | | 44106.93 | |
| Excluding gender | | | | | | |
| Age | 2.98 | (2.88 to 3.08) | <0.001 | 2.95 | (2.84 to 3.05) | <0.001 |
| $Age^2$ | -0.36 | (-0.37 to -0.34) | <0.001 | -0.35 | (-0.36 to -0.33) | <0.001 |
| Ln(SF-6D) | 3.19 | (3.07 to 3.31) | <0.001 | NA | NA | NA |
| PCS | NA | NA | NA | 1.37 | (1.20 to 1.53) | <0.001 |
| $PCS^2$ | NA | NA | NA | -0.09 | (-0.11 to -0.07) | <0.001 |
| MCS2 | NA | NA | NA | 1.19 | (1.04 to 1.33) | <0.001 |
| $MCS^2$ | NA | NA | NA | -0.09 | (-0.11 to -0.07) | <0.001 |
| Constant | -4.24 | (-4.42 to -4.05) | <0.001 | -13.2 | (-13.70 to -12.70) | <0.001 |
| | | | | | | |
| AUROC | 0.7255 | | | 0.7394 | | |
| Sensitivity | 85.14% | | | 86.41% | | |
| Specificity | 45.62% | | | 46.96% | | |
| Correctly classified | 70.01% | | | 71.31% | | |
| AIC | 45597.59 | | | 44489.63 | | |
| BIC | 45631.86 | | | 44549.61 | | |

N.B. Age, PCS and MCS were all divided by 10 (this was done before squaring PCS and MCS).

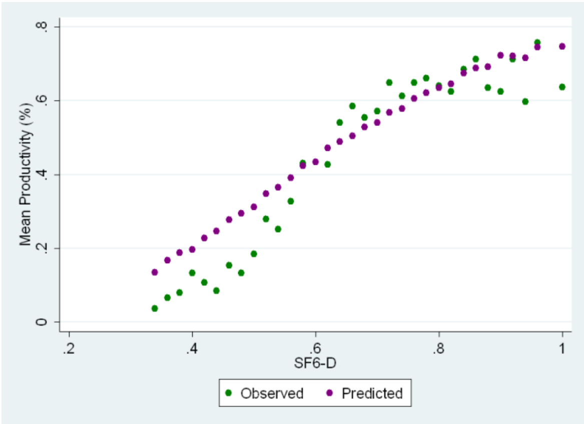
Figure 8 shows observed versus expected values for both models. For consistency all figures use the same x-axis (SF-6D). For each model two graphs are displayed; one using the original SF-6D values (of which there are 348 unique values), the other using broad SF-6D values (calculated by rounding the original SF-6D values to the nearest 0.02, resulting in 33 unique values). The Figures show that the SF-6D model tends to over-predict productivity at lower health values, whilst the MCS and PCS model provides good estimates throughout. The results from both the goodness of fit measures and the graphical comparisons indicate that the MCS and PCS model is to be preferred to the SF-6D model.

The analyses looking at the relationship between SF12 and productivity were repeated excluding the gender explanatory variable. Figure 8 show observed versus expected values for both models. As before, the SF-6D model tends to over-predict productivity at lower health values, whilst the MCS and PCS model provides good estimates throughout. The results from both the goodness of fit measures and the graphical comparisons indicate that the MCS and PCS model is to be preferred to the SF-6D model. A comparison of the summary goodness of fit measures presented indicates that models which included gender are preferred. Separate models for males and females may be required.

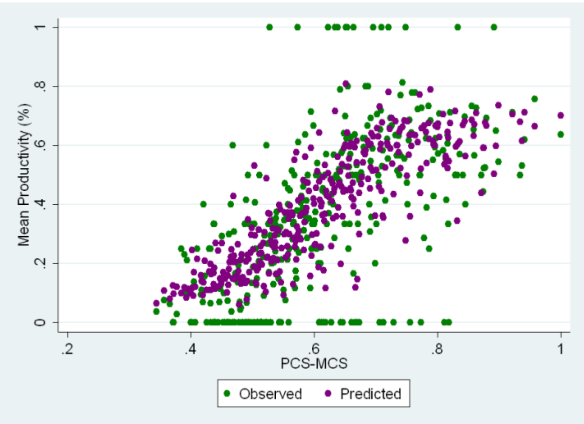
**Figure 8: Observed versus expected values for probability of employment by SF-6D**

Model 1 (SF-6D); average observed vs expected by SF-6D value

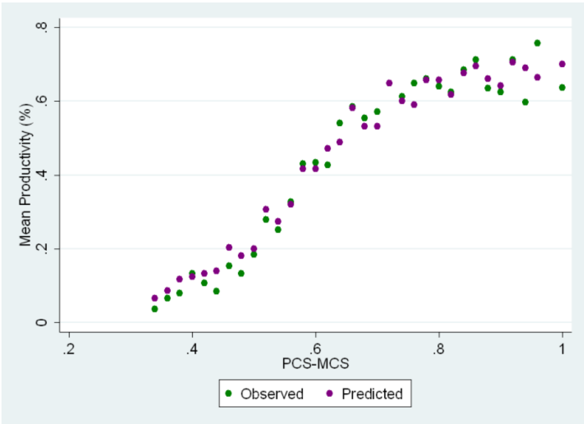

Model 1 (SF-6D); average observed vs expected by broad SF-6D value




Model 2 (PCS-MCS); average observed vs expected by SF-6D value




Model 2 (PCS-MCS); average observed vs expected by broad SF-6D value




### 4.6.3 Estimating productivity from EQ-5D

Example productivity estimates were generated for a sample of ICD groups, and a sample of EQ-5D states (Table 8, Figure 9). These examples were generated using both the SF-6D model and the MCS and PCS model, for 45-year old females. The results indicate that there is generally good agreement between the method using SF-6D and the method using PCS and MCS, with the exception of EQ-5D scores roughly equal to zero. This may be because both the mapping from EQ-5D to SF-6D and from

SF-6D to productivity were relatively poor for low values of EQ-5D and low values of SF-6D respectively. The results also indicate that there is generally little change in productivity for EQ-5D values above about 0.25, with productivity ranging from about 70% to about 85%.

**Table 8: Estimated productivity in the last week**

(by selected ICD group and EQ-5D preference-based scores)

| | EQ-5D = -0.255 (State 2,3,1,3,3) | | EQ-5D = -0.001 (State 3,3,1,2,1) | | EQ-5D = 0.244 (State 2,3,1,2,1) | |
|---|---|---|---|---|---|---|
| | SF-6D | MCS&PCS | SF-6D | MCS&PCS | SF-6D | MCS&PCS |
| Group 01 | 35.36% | 32.24% | 61.49% | 36.70% | 70.33% | 59.50% |
| Group 11 | 39.66% | 36.91% | 64.55% | 41.40% | 72.68% | 63.37% |
| Group 17 | 39.75% | 39.32% | 64.61% | 44.85% | 72.73% | 65.95% |
| Group 25 | 43.26% | 39.15% | 66.97% | 43.81% | 74.53% | 65.22% |
| Group 30 | 42.77% | 40.02% | 66.65% | 44.82% | 74.29% | 65.97% |
| Group 43 | 36.09% | 29.75% | 65.61% | 45.21% | 73.50% | 66.20% |
| Group 56 | 38.93% | 31.71% | 67.44% | 46.71% | 74.90% | 67.33% |
| | EQ-5D = 0.487 (State 2,1,3,1,1) | | EQ-5D = 0.746 (State 2,2,1,1,1) | | EQ-5D = 1 (State 1,1,1,1,1) | |
| | SF-6D | MCS&PCS | SF-6D | MCS&PCS | SF-6D | MCS&PCS |
| Group 01 | 66.36% | 59.72% | 77.70% | 74.27% | 82.63% | 83.93% |
| Group 11 | 69.04% | 63.55% | 79.42% | 76.71% | 83.92% | 85.21% |
| Group 17 | 69.10% | 66.17% | 79.46% | 78.29% | 83.94% | 85.98% |
| Group 25 | 71.16% | 65.40% | 80.77% | 77.85% | 84.93% | 85.79% |
| Group 30 | 70.88% | 66.14% | 80.59% | 78.30% | 84.80% | 86.01% |
| Group 43 | 69.98% | 66.43% | 80.02% | 78.44% | 84.36% | 86.04% |
| Group 56 | 71.57% | 67.52% | 81.04% | 79.12% | 85.13% | 86.41% |

**Figure 9: Estimated productivity by selected ICD groups and EQ-5D values**


# 5. DISCUSSION

The research described above was commissioned to address concerns relating to the representativeness of the HODaR respondents compared with the general population, the differences in recall periods for the EQ-5D and the periods of absence from work due to illness, and the use of the ICD-10 chapter headings. Results from models that have been developed show that they are able to predict productivity losses at the aggregate level. As decision making is usually based on groups of patients, productivity loss estimates from these models may be sufficiently accurate.

## 5.1 Data

The approach used in this study involved using two different datasets and it is important to consider whether these were suitable for developing the final models. The comparison of the HODaR and US data shows that in general the respondents in the HODaR data are older and have lower HRQoL than the general population. However, comparing matched sub-groups using the self-reported conditions in Understanding Society and the corresponding relevant ICD-10 codes in HODaR, the 95% confidence intervals of the means overlap for several comparisons and in particular for cancer, depressive illness and thyroid. These results suggest that while the characteristics of the HODaR respondents are not directly representative of people in the general population with similar conditions, the people are not totally dissimilar and increases confidence in using the HODaR data to generalise to patients with some of the health conditions.

The US data exhibit a clear relationship between HRQoL (SF-6D) and reported absence from work due to ill health. The probability of absence from work in these data increases rapidly as quality of life decreases. Very few respondents who indicated they had good HRQoL (SF-6D>0.8) also indicated they were off work sick in the previous week. This is in stark contrast to the results from the HODaR data where a substantial proportion of respondents who indicated they were in full health (EQ-5D=1) also reported absence from work during the previous 6 weeks due to ill health. These results provide support for the critique relating to the difference in recall periods for the quality of life instruments and absence of work due to ill health, and provides strong evidence that the recall periods used in Understanding Society (SF12: previous 4 weeks; absence from work: previous week) are more appropriate than those used in HODaR (EQ-5D: today; absence from work: previous 6 weeks). The use of general population data to represent the probability of absence from work due to sickness is also a potential improvement compared to the HODaR data.

In the US data, respondents who reported they did not have one of the named prevalent health conditions were also less likely to be off work sick than those who reported they had at least one of the conditions (1% vs 3%). However, when comparing these two sub-groups categorised by SF-6D band, the converse is true for respondents with lower levels of quality of life (SF-6D < 0.5) with respondents who indicated they did not have a condition being more likely to have been off work sick (NB the sample size is relatively small in this comparison). The latter results may be due to the fact that not all health conditions are captured by the named conditions in the US questionnaire. However, it also raises concerns relating to the reliability of self-reported conditions compared to responses derived from clinically recorded diagnoses, such as in the HODaR data. Collectively, these points indicate that a) it is more appropriate to use the full US dataset when exploring the probability of absence from work, as opposed to using sub-groups of respondents identified by positive responses to the health conditions question and b) it is more appropriate to use the HODaR data when informing relationships relating to health conditions/ICD-10 codes such as predicting SF-6D scores controlling for age, gender, EQ-5D responses and ICD category and predicting the number of days off work sick, given the probability of absence from work controlling for age, gender and ICD category.

Where possible, ICD-10 codes were disaggregated and a total of 57 sub-groups categorised by 3-digit ICD-10 codes were used in the current analyses. Subject to the number of respondents in the HODaR data, the selections for the final sub-groups were informed by the preferred categories provided by the DH, and the programme budget categories (PBC) used in a related piece of research. Despite the relatively large sample from HODaR (n=35,126), it was not possible to cover every possible health condition defined in the ICD-10 dictionary, but it should be possible to identify "similar" conditions for those ICD-10 codes which are not explicitly mentioned.

## 5.2 Existing data

There is little existing literature looking at the relationship between EQ-5D and productivity. Lamers *et al.*considered days absent from work in the last 6-weeks and EQ-5D scores (Lamers 2005) However, they looked at average EQ-5D score by productivity, as opposed to average productivity by EQ-5D score, hence the results cannot be directly compared with those reported from US. However, the authors found that lower rates of productivity had lower average EQ-5D scores, consistent with the association observed for this work.

Krol looked at estimating productivity by EQ-5D health state where health state was defined using the possible responses to the five EQ-5D health dimensions.(Krol 2012) Productivity was assessed via an online questionnaire, where a sample of the Dutch general population (n = 1,100) were asked, hypothetically, what proportion of people would be absent from work for given EQ-5D health states. Results were presented for 40-year old males, and use the Dutch national tariff for EQ-5D (as opposed to the United Kingdom tariff used for this work). Selected comparisons between the results found by Krol and those found in this study (Appendix 3, Table A3.9). They show close agreement for the EQ-5D states "1,1,1,1,1" and "2,2,1,1,1", but large disagreement for the remaining states, with the estimates produced for this work much greater than the estimates produced by Krol. It should be noted that the estimates produced by Krol are based on hypothetical productivity levels, as opposed to observed levels of productivity.

## 5.3 Limitations

There are limitations with the research presented here. Firstly, it is never ideal to use a “double mapping” approach. However, the comparisons of the observed and predicted values illustrate that the individual models perform extremely well on the aggregate level for all the sub-groups tested. While the end product (the number of days off work for each age, gender, ICD group and EQ-5D score) appear reasonable, it is not currently possible to validate these predictions in external data as such data do not exist. A second related limitation is that the predictions are currently limited to point estimates. It would be more appropriate to characterise the uncertainty around these estimates but this was not possible due to the time constraints of the current project.

Thirdly, although the US data are used to determine the probability of absence from work due to ill health, the current analyses retain the HODaR data for estimating the number of days off work. It is possible that the total number of days of work due to ill health is over-estimated by using the data from people who have been recently discharged from hospital. However, as mentioned previously, a proportion of the HODaR patients will have recovered from the effects of the condition or event they were hospitalised for, and given that the probability of being off work is derived from the general population, it is not believed that the over-estimation would be substantial.

Finally, although the data were sub-grouped by ICD-10 categories, it was not possible to identify either severity or duration of the particular conditions. However, as the EQ-5D health dimensions are used as explanatory variables, the additional knowledge of disease duration and or disease severity could possibly confound these effects. Further work is undeway to collect more robust data that can be used to address the limitations addressed here. In addtion, external validation of the models presented here needs to be undertaken once suitable data are available.

## 5.4 Summary

The analysis reported here allows productivity losses associated with HRQoL based on EQ-5D and ICD codes to be predicted for inclusion in health technology assessment. It addressed some of the limitations of existing work using two datasets. The results show that models can predict productivity accurately at the aggregate level. Further work is recommended to valdate these models as well as primary data collection of productivity and HRQoL to avoid the ‘double-mapping’ approach used here.

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## APPENDIX 1: International Classification of Diseases

Table A1.1: PBC groups (Source: CHE Research Paper 81)

| PBC | Definition | ICD10 categories | | | | | |
|---|---|---|---|---|---|---|---|
| 01 | Infectious Diseases | B20-B24 | A30-A49 | A20-A28 | A90-A99 | A75-A79 | A65-A69 |
| | | B00-B09 | B35-B49 | B50-B64 | B25-B34 | B65-B83 | B85-B89 |
| | | A80-A89 | B98-B99 | R50-R69 | R70-R99 | Z20-Z29 | Z80-Z99 |
| 02 | Cancer & Tumours | C50-C58 | C15-C26 | C60-C63 | C64-C68 | C30-C39 | C81-C96 |
| | | C43-C44 | C45-C49 | C76-C80 | C69-C72 | C00-C14 | C73-C75 |
| | | J95-J99 | C40-C41 | C97- | D00-D09 | D10-D36 | D37-D48 |
| | | N30-N39 | Z00-Z13 | Z40-Z54 | Z80-Z99 | | |
| 03 | Disorders of Blood | D60-D64 | D50-D53 | D70-D77 | D80-D89 | D55-D59 | D65-D69 |
| | | Q80-Q89 | R70-R99 | | | | |
| 04 | Endocrine, Nutritional & Metabolic Issues | E10-E14 | E79-E90 | E00-E07 | E24-E27 | E28-E30 | E31-E35 |
| | | E70-E72 | E15-E16 | E20-E21 | E22-E23 | E65-E68 | E73-E74 |
| | | E76-E78 | E75 | E50-E64 | E40-E46 | R50-R69 | R70-R99 |
| 05 | Mental Health Disorders | F10-F19 | F30-F39 | F40-F48 | F50-F59 | F00-F09 | F20-F29 |
| | | G30-G32 | F60-F69 | F90-F98 | F99 | Z55-Z65 | |
| 06 | Problems of Learning Disability | F80-F89 | F70-F79 | Q90-Q99 | F90-F98 | Z80-Z99 | |
| 07 | DNeurological | G40-G47 | G20-G26 | G30-G32 | G90-G99 | G50-G59 | G35-G37 |
| | | G60-G64 | G80-G83 | G00-G09 | G10-G13 | G70-G73 | A80-A89 |
| | | H90-H95 | Q00-Q07 | B00-B09 | N30-N39 | A30-A49 | B25-B34 |
| | | B65-B83 | A15-A19 | B50-B64 | R00-R09 | R20-R23 | R25-R29 |
| | | R30-R39 | R40-R46 | R47-R49 | R50-R69 | R70-R99 | Z80-Z99 |
| 08 | Problems of Vision | H49-H52 | H40-H42 | H25-H28 | H00-H06 | H30-H36 | H15-H19 |
| | | H55-H59 | H10-H13 | H20-H22 | H43-H45 | H46-H48 | H53-H54 |
| | | A70-A74 | B25-B34 | B50-B64 | B65-B83 | Q10-Q18 | Z40-Z54 |
| | | Z80-Z99 | | | | | |
| 09 | Problems of Hearing | H90-H95 | H65-H75 | H80-H83 | H60-H62 | Q10-Q18 | |
| 10 | Problems of Circulation | I20-I25 | I60-I69 | Q20-Q28 | I30-I52 | I80-I89 | I70-I79 |
| | | I10-I15 | I26-I28 | I95-I99 | I00-I02 | I05-I09 | B50-B64 |
| | | R00-R09 | R50-R69 | Z40-Z54 | Z80-Z99 | | |
| 11 | Problems of Respiratory System | J40-J47 | J00-J06 | J09-J18 | J60-J70 | J30-J39 | J20-J22 |
| | | J80-J84 | J90-J94 | J95-J99 | A30-A49 | J85-J86 | B35-B49 |
| | | A15-A19 | A70-A74 | B25-B34 | R00-R09 | R70-R99 | Z00-Z13 |
| | | Z40-Z54 | Z80-Z99 | Q30-Q34 | | | |
| 12 | Dental Problems | K00-K14 | | | | | |
| 13 | Problems of the Gastro Intestinal System | A00-A09 | K20-K31 | K35-K38 | K55-K63 | K70-K77 | K80-K87 |
| | | K50-K52 | K65-K67 | K90-K93 | Q35-Q45 | B65-B83 | I80-I89 |
| | | B15-B19 | K00-K14 | A20-A28 | A65-A69 | A90-A99 | B35-B49 |
| | | R10-R19 | R70-R99 | Z80-Z99 | | | |

| PBC | Definition | ICD10 categories | | | | | |
|---|---|---|---|---|---|---|---|
| 14 | Problems of the Skin | L80-L99 | L60-L75 | L20-L30 | L00-L08 | L40-L45 | L10-L14 |
| | | L50-L54 | L55-L59 | N30-N39 | B00-B09 | B35-B49 | B85-B89 |
| | | A20-A28 | A30-A49 | A65-A69 | Q80-Q89 | Z40-Z54 | Z80-Z99 |
| | | R20-R23 | R70-R99 | T20-T32 | | | |
| 15 | Problems of the Musculoskeletal System | M15-M19 | M05-M14 | M45-M49 | M80-M90 | M70-M79 | M20-M25 |
| | | M30-M36 | M40-M43 | M50-M54 | M91-M94 | M60-M63 | M65-M68 |
| | | M95-M99 | M00-M03 | A15-A19 | Q65-Q79 | Q10-Q18 | |
| | | Q80-Q89 | Z40-Z54 | | | | |
| 16 | Problems due to Trauma and Injuries | S00-S99 | T00-T79 | Z57-Z59 | | | |
| 17 | Problems of the Genito-urinary System | N30-N39 | A50-A64 | N25-N29 | I10-I15 | N00-N08 | N20-N23 |
| | | N10-N16 | N17-N19 | B25-B34 | Q60-Q64 | B65-B83 | Q50-Q56 |
| | | R30-R39 | R70-R99 | Z40-Z54 | Z80-Z99 | | |
| 18, 19 | Maternity and Reproductive Health & Conditions of Neonates | O30-O48 | O60-O75 | P05-P08 | O20-O29 | O80-O84 | P20-P29 |
| | | O85-O92 | O95-O99 | P10-P15 | P50-P61 | P90-P96 | P00-P04 |
| | | P35-P39 | P70-P74 | N30-N39 | P75-P78 | P80-P83 | O10-O16 |
| | | A30-A49 | O00-O08 | A30-A49 | R70-R99 | Z30-Z39 | Z80-Z99 |
| 20 | Adverse Effects and Poisoning | O85-O92 | O95-O99 | K90-K93 | O20-O29 | O60-O75 | L55-L59 |
| | | L60-L75 | Q80-Q89 | R70-R99 | T36-T50 | T51-T65 | T66-T78 |
| | | T80-T88 | Z80-Z99 | O00-O08 | N30-N39 | | |
| 21 | Health Individuals | E65-E68 | E76-E78 | Z00-Z13 | Z20-Z29 | Z40-Z54 | Z55-Z65 |
| 22 | Social Care Needs | Z74-Z75 | | | | | |
| 23 | Other areas of Spend/Conditions | Q92-Q99 | R53-R98 | Z09-Z91 | | | |

Source: K Claxton, S Martin, M Soares, N Rice, E Spackman, S Hinde, N Devlin, P C Smith, M Sculpher. Methods for the Estimation of the NICE Cost Effectiveness Threshold. CHE Research Paper 81.

Table A1.2: ICD-10 codes as used in the ICD groups in the current project

| ICD Group | Definition of health condition and corresponding ICD-10 codes |
|---|---|
| 1 | Malignant neoplasms of digestive organs<br>C15 C16 C17 C18 C19 C20 C21 C22 C24 C25 C26 |
| 2 | Malignant neoplasms of respiratory and intrathoracic organs<br>C30 C31 C32 C34 C37 C38 |
| 3 | Melanoma and other malignant neoplasms of skin, mesothelial and soft tissue<br>C43 C44 C45 C48 C49 |
| 4 | Malignant neoplasm of breast<br>C50 |
| 5 | Malignant neoplasms of female genital organs<br>C51 C52 C53 C54 C55 C56 C57 |
| 6 | Malignant neoplasms of male genital organs<br>C60 C61 C62 C63 |
| 7 | Malignant neoplasms of urinary tract<br>C64 C67 |
| 8 | Malignant neoplasms, stated or presumed to be primary, of lymphoid, haematopoietic and related<br>C81 C82 C83 C84 C85 C88 C90 C91 C92 C96 |
| 9 | In situ neoplasms<br>D00 D01 D02 D03 D04 D05 D06 D07 D09 |
| 10 | Benign neoplasms<br>D10 D11 D12 D13 D14 D15 D16 D17 D18 D19 D21 D22 D23 D24<br>D25 D26 D27 D28 D29 D30 D31 D32 D33 D34 D35 D36 |
| 11 | Neoplasms of uncertain or unknown behaviour<br>D37 D38 D39 D40 D41 D42 D43 D44 D45 D46 D47 D48 |
| 12 | Diseases of the blood and blood-forming organs and certain disorders involving the immune<br>D50 D51 D52 D53 D57 D58 D59 D61 D64 D66 D67 D68 D69 D70<br>D72 D73 D75 D80 D83 D84 D86 D89 Q89 |
| 13 | Diabetes mellitus<br>E10 E11 E14 |
| 14 | Other disorders of glucose regulation, pancreatic internal secretion, of endocrine glands<br>E16 E20 E21 E22 E23 E24 E26 E27 E28 E29 E31 E32 E34 |
| 15 | Endocrine, Nutritional & Metabolic Issues<br>E46 E53 E61 E71 E72 E75 E80 E83 E84 E85 E86 E87 E88 E89 |
| 16 | Disorders of thyroid gland<br>E03 E04 E05 E06 E07 |
| 17 | Mental Health Disorders<br>F06 F07 F10 F11 F13 F15 F30 F41 F43 F45 F50 F51 F52 F62<br>F64 F80 R63 R74 R79 Z72 |
| 18 | Demyelinating diseases of the central nervous system<br>G35 G37 |
| 19 | Episodic and paroxysmal disorders<br>G40 G41 G43 G44 G45 G47 |
| 20 | Nerve, nerve root and plexus disorders<br>G50 G51 G52 G54 G56 G57 G58 |
| 21 | Other disorders of the nervous system<br>G60 G61 G62 G70 G71 G72 G80 G81 G82 G83 G90 G91 G93 G95<br>G96 G97 G98 |
| 22 | Infectious Disease not covered elsewhere<br>B58 H00 H01 H02 H04 H05 H10 H11 H16 H17 H18 H20 H21 H27<br>Q10 Z46 |
| 23 | Disorders of lens<br>H25 H26 |
| 24 | Disorders of choroid and retina<br>H30 H33 H34 H35 |
| 25 | Diseases of the eye and adnexa<br>H40 H43 H44 H46 H47 H49 H50 H51 H52 H53 H54 H57 H59 |

| ICD Group | Definition of health condition and corresponding ICD-10 codes |
|---|---|
| 26 | Diseases of the ear and mastoid process<br>H60 H61 H65 H66 H69 H70 H71 H72 H73 H74 H80 H81 H83 H90 |
| 27 | Ischemic Heart Diseases<br>I20 I21 I22 I23 I25 I26 |
| 28 | Hypertensive disease and cerebrovascular diseases<br>I10 I11 I12 I60 I61 I62 I63 I64 I65 I66 I67 |
| 29 | Diseases of arteries, veins and lymphatic vessels and nodes<br>I70 I71 I72 I73 I74 I77 I78 I80 I82 I83 I84 I85 I86 I87 |
| 30 | Acute upper respiratory infections<br>J00 J01 J02 J03 J04 J05 J06 |
| 31 | Influenza and pneumonia<br>J10 J11 J12 J13 J14 J15 J18 |
| 32 | Other acute lower respiratory infections<br>J20 J21 J22 |
| 33 | Other diseases of upper respiratory tract<br>J30 J31 J32 J33 J34 J35 J36 J37 J38 J39 |
| 34 | Chronic lower respiratory diseases<br>J40 J42 J43 J44 J45 J47 |
| 35 | Problems of Respiratory System not covered elsewhere<br>J64 J67 J69 J81 J82 J84 J85 J86 J90 J92 J93 J94 J95 J96 |
| 36 | Arthropathies and arthrosis<br>M00 M05 M06 M08 M10 M11 M12 M13 M15 M16 M17 M18 M19 M20<br>M21 M22 M23 M24 M25 M30 M31 M32 M33 M34 M35 |
| 37 | Dorsopathies<br>M40 M41 M42 M43 M45 M46 M47 M48 M50 M51 M53 M54 |
| 38 | Disorders of muscles, synovium and tendon and other soft tissues<br>M60 M62 M65 M67 M70 M71 M72 M75 M76 M77 M79 |
| 39 | Disorders of bone density & structure, osteopathies and chondropathies<br>M80 M81 M84 M86 M87 M89 M92 M93 M94 |
| 40 | Diseases of the genitourinary system (1)<br>N02 N04 N05 N06 N10 N12 N13 N17 N18 N19 N20 N21 N23 N25<br>N28 N30 N31 N32 N35 N36 N39 |
| 41 | Diseases of male genital organs<br>N40 N41 N43 N44 N45 N47 N48 N49 N50 |
| 42 | Diseases of the genitourinary system (2)<br>N46 N61 N62 N64 N70 N71 N72 N73 N75 N76 N80 N81 N82 N83<br>N84 N85 N86 N87 N88 N89 N90 N91 N92 N93 N95 N97 N98 N99 |
| 43 | Infectious Diseases (1)<br>A40 A41 A48 A49 B20 B23 B24 B27 B34 B51 B59 B60 B99 R50<br>Z22 Z83 |
| 44 | Cancer & Tumours not identified in other groups<br>C00 C01 C02 C03 C04 C06 C07 C09 C11 C41 C69 C70 C71 C72<br>C73 C75 C76 C77 C78 C79 C80 N60 N63 Z08 Z51 Z80 Z85 |
| 45 | Cancer & Tumours not identified in other groups (2)<br>Q99 R53 R54 R59 R60 R82 R89 Z09 Z48 Z52 Z53 Z54 Z76 Z91 |
| 46 | DNeurological<br>A39 A86 A87 B01 B02 B50 G00 G03 G06 G08 G10 G11 G12 G20<br>G21 G23 G24 G25 G31 N94 Q04 Q05 Q06 Q07 R07 R20 R25 R26<br>R27 R29 R30 R40 R41 R42 R45 R47 R49 R51 R52 R55 R56 R61<br>R90 R93 R94 |
| 47 | Problems of the Gastro Intestinal System<br>K91 L56 O08 O86 O90 R78 T36 T38 T39 T40 T41 T42 T43 T44<br>T45 T46 T48 T49 T50 T51 T52 T54 T56 T62 T63 T65 T78 T81<br>T82 T83 T84 T85 T86 T87 T88 T91 Z88 |
| 48 | Problems of Circulation not covered elsewhere<br>I05 I06 I07 I08 I27 I28 I30 I31 I33 I34 I35 I38 I42 I44<br>I45 I46 I47 I48 I49 I50 I51 Q21 Q23 Q24 Q25 Q27 Q28 R00<br>R01 R02 R03 Z45 Z50 |

| ICD | Definition of health condition and corresponding ICD-10 codes | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49 | Problems of Respiratory System not covered elsewhere | | | | | | | | | | | | | |
| | A15 | A31 | B25 | B44 | Q33 | R04 | R05 | R06 | R09 | R91 | Z03 | Z43 | Z87 | Z93 |
| 50 | Diseases of oral cavity, salivary glands and jaws | | | | | | | | | | | | | |
| | K00 | K01 | K02 | K04 | K05 | K06 | K07 | K08 | K09 | K10 | | | | |
| 51 | Problem Gastro intestinal system including gallbladder, pancreas, peritoneum, liver, digestive system | | | | | | | | | | | | | |
| | A04 | A06 | A07 | A08 | A09 | B15 | B16 | B18 | B19 | B37 | B67 | K11 | K12 | K13 |
| | K14 | K20 | K21 | K22 | K25 | K26 | K27 | K29 | K30 | K31 | K35 | K37 | K38 | K40 |
| | K41 | K42 | K43 | K44 | K45 | K46 | K50 | K51 | K52 | K55 | K56 | K57 | K58 | K59 |
| | K60 | K61 | K62 | K63 | K65 | K66 | K70 | K71 | K72 | K73 | K74 | K75 | K76 | K80 |
| | K81 | K82 | K83 | K85 | K86 | K90 | K92 | Q38 | Q39 | Q43 | R10 | R11 | R12 | R13 |
| | R14 | R15 | R17 | R18 | R19 | Z98 | | | | | | | | |
| 52 | Problems of the Skin | | | | | | | | | | | | | |
| | A46 | B00 | B07 | B08 | B35 | B36 | L02 | L03 | L04 | L05 | L08 | L10 | L12 | L20 |
| | L23 | L27 | L28 | L29 | L30 | L40 | L42 | L43 | L50 | L51 | L52 | L53 | L57 | L60 |
| | L66 | L68 | L70 | L71 | L72 | L73 | L74 | L81 | L82 | L84 | L85 | L88 | L89 | L90 |
| | L91 | L92 | L94 | L95 | L97 | L98 | Q82 | Q83 | Q84 | Q85 | R21 | R22 | R23 | R92 |
| | Z41 | Z42 | | | | | | | | | | | | |
| 53 | Problems due to Trauma and Injuries | | | | | | | | | | | | | |
| | S00 | S01 | S02 | S03 | S05 | S06 | S09 | S10 | S11 | S12 | S13 | S14 | S19 | S20 |
| | S21 | S22 | S23 | S26 | S27 | S29 | S30 | S31 | S32 | S33 | S35 | S36 | S37 | S39 |
| | S41 | S42 | S43 | S46 | S49 | S50 | S51 | S52 | S53 | S56 | S60 | S61 | S62 | S63 |
| | S64 | S66 | S68 | S69 | S70 | S71 | S72 | S73 | S76 | S80 | S81 | S82 | S83 | S86 |
| | S89 | S90 | S91 | S92 | S93 | S96 | S99 | T02 | T08 | T13 | T14 | T15 | T16 | T17 |
| | T18 | T19 | T21 | T70 | T79 | | | | | | | | | |
| 54 | Problems of the Genito-urinary System | | | | | | | | | | | | | |
| | A52 | A56 | A60 | A63 | B26 | Q52 | Q53 | Q54 | Q55 | Q61 | Q64 | R31 | R32 | R33 |
| | R35 | R36 | R39 | R80 | R86 | R87 | Z94 | Z96 | | | | | | |
| 55 | Problems of Respiratory System not covered elsewhere | | | | | | | | | | | | | |
| | A18 | M95 | M96 | Q18 | Q66 | Q76 | Q78 | Q79 | Z44 | Z47 | | | | |
| 56 | Maternity and Reproductive Health & Conditions of Neonates | | | | | | | | | | | | | |
| | O00 | O01 | O02 | O03 | O04 | O06 | O10 | O12 | O13 | O14 | O15 | O16 | O20 | O21 |
| | O23 | O26 | O30 | O32 | O33 | O34 | O35 | O36 | O40 | O41 | O42 | O43 | O44 | O45 |
| | O46 | O47 | O48 | O60 | O61 | O62 | O63 | O64 | O66 | O68 | O69 | O70 | O72 | O75 |
| | O80 | O82 | O98 | O99 | Z30 | Z31 | Z34 | Z35 | Z36 | Z37 | Z38 | Z39 | Z92 | |
| | Healthy | | | | | | | | | | | | | |
| | E78 | Z00 | Z01 | Z04 | Z12 | Z13 | Z26 | Z29 | Z40 | Z63 | Z71 | Z75 | | |

# APPENDIX 2: COMPARING HODAR AND US DATA

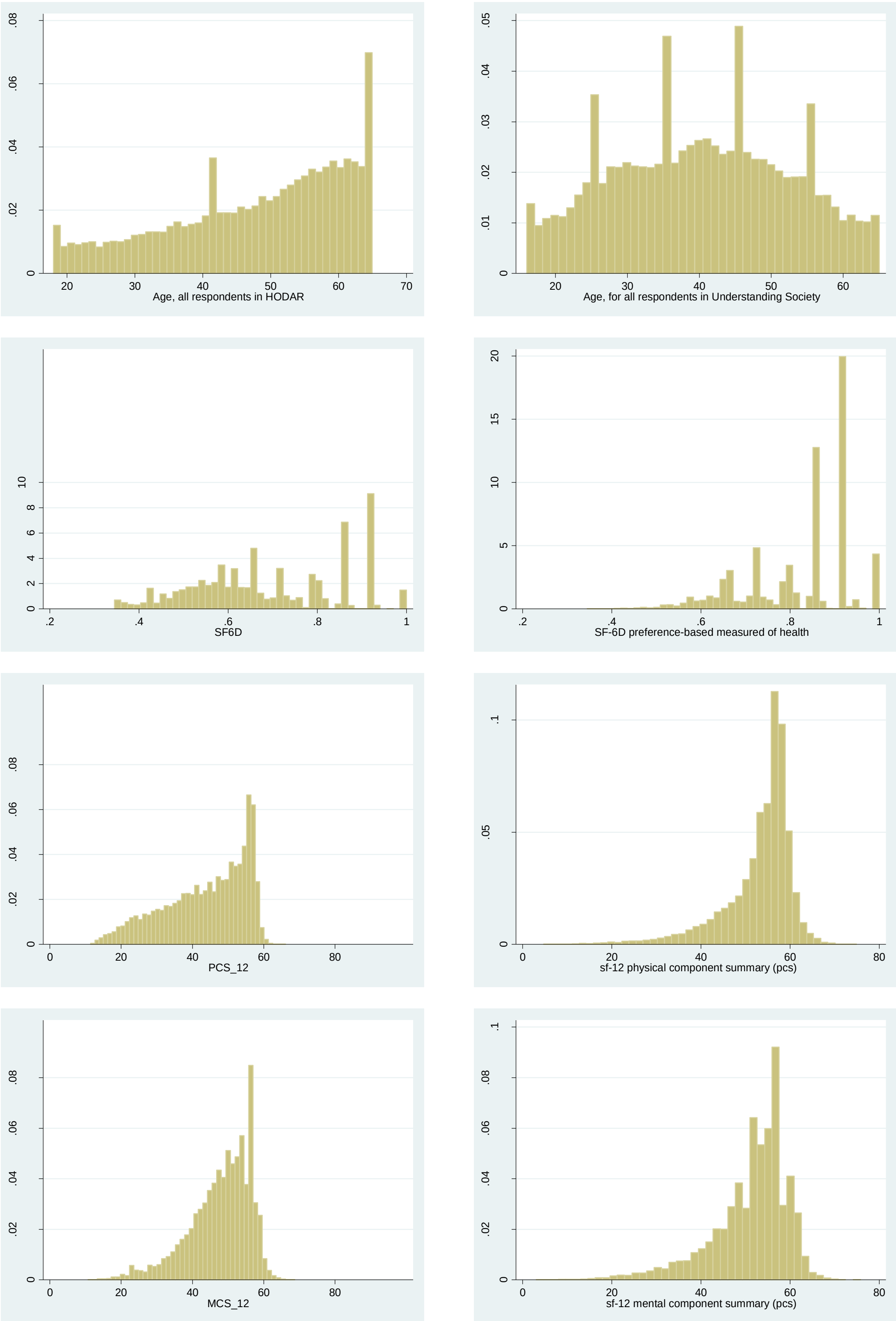
Table A2.1: Groups used when matching the ICD in HODaR to the conditions in Understanding Society

| | HODaR | | | Understanding Society | |
|---|---|---|---|---|---|
| Group | N | ICD codes | | N | Self-reported "Current" condition |
| 1 | 468 | J20-J22<br><br>J40-J47 | Other acute lower respiratory infections<br>Chronic lower respiratory diseases | 2371 | Asthma,<br>emphysema,<br>bronchitis |
| 2 | 4457 | M05-M95 | Diseases of the musculoskeletal system and connective tissue | 1,613 | Arthritis |
| 3 | 3331 | I10-I15<br>I20-I25<br>I26-I28<br><br><br>I30-I50<br>I60-I69 | Hypertensive diseases<br>Ischaemic heart diseases<br>Pulmonary heart disease and diseases of pulmonary circulation<br>Other forms of heart disease<br>Cerebrovascular diseases | 181 | Congestive heart failure,<br>CHD, angina, heart attack or MI,<br>stroke,<br>HBP |
| 4 | 106 | E00-E07 | Disorders of thyroid gland | 570 | Hyperthyroid<br>Hypothyroid |
| 5 | 97 | K70-K77 | Diseases of liver | 127 | Any Liver Condition |
| 6 | 3422 | C00-D48 | Neoplasms | 110 | Cancer/malignancy |
| 7 | 148 | E10-E14 | Diabetes mellitus | 714 | Diabetes |
| 8 | 271 | G40-G47 | Episodic and paroxysmal disorders | 116 | Epilepsy |
| 9 | 74 | F00-F99 | Mental and behavioural disorders | 658 | Clinical depression |

Figure A2.1: Comparing the data in HODaR and Understanding Society

HODaR (full dataset)

Understanding Society (full dataset)



Comparing the matched sub-groups (n=9), the summary statistics in Table A2.2 show, on average the groups in HODaR are:

- older (except DM)
- have lower HRQoL scores (except MCS for clinical depression)
- greater proportions report problems on all health dimensions (data not shown)

Table A2.2: Summary stats from HODaR & US for 9 Broad conditions groups

| | HODaR | | US | | HODaR | | US | | HODaR | | US | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mean | sd | mean | sd | mean | sd | mean | sd | mean | sd | mean | sd |
| | Respiratory | | | | Arthritis | | | | CHD | | | |
| N | 468 | | 2371 | | 4457 | | 1613 | | 3331 | | 181 | |
| Age | 49.60 | 12.75 | 39.84 | 12.5 | 59.65 | 11.37 | 51.25 | 9.31 | 55.66 | 8.14 | 53.32 | 9.96 |
| SF-6D | 0.642 | 0.16 | 0.792 | 0.13 | 0.6205 | 0.16 | 0.7471 | 0.14 | 0.655 | 0.15 | 0.750 | 0.14 |
| MCS | 45.67 | 9.38 | 50.03 | 9.65 | 47.65 | 8.88 | 50.67 | 10.4 | 47.56 | 8.46 | 50.93 | 9.49 |
| PCS | 38.97 | 11.97 | 50.54 | 9.34 | 37.44 | 11.62 | 44.58 | 11.9 | 40.30 | 11.19 | 42.2 | 11.8 |
| | Diabetes | | | | Epilepsy | | | | Depress | | | |
| N | 148 | | 714 | | 271 | | 116 | | 74 | | 658 | |
| Age | 44.33 | 13.49 | 49.63 | 9.94 | 45.19 | 13.23 | 39.91 | 11.84 | 45.04 | 11.64 | 42.36 | 11.04 |
| SF-6D | 0.6802 | 0.15 | 0.7818 | 0.14 | 0.6613 | 0.16 | 0.7872 | 0.13 | 0.619 | 0.13 | 0.6519 | 0.12 |
| MCS | 45.62 | 9.14 | 50.89 | 9.78 | 45.72 | 8.84 | 49.68 | 9.50 | 42.07 | 9.01 | 37.07 | 12.35 |
| PCS | 44.37 | 11.57 | 46.77 | 10.05 | 42.81 | 11.90 | 50.2 | 8.92 | 43.62 | 11.12 | 50.03 | 11.17 |
| | Thyroid | | | | Liver | | | | Cancer | | | |
| N | 106 | | 570 | | 97 | | 127 | | 3422 | | 110 | |
| Age | 46.41 | 11.21 | 47.4 | 10.33 | 49.96 | 9.10 | 45.72 | 11.12 | 50.66 | 11.46 | 48.61 | 10.59 |
| SF-6D | 0.7226 | 0.14 | 0.7778 | 0.13 | 0.6119 | 0.16 | 0.7383 | 0.14 | 0.7073 | 0.16 | 0.7202 | 0.16 |
| MCS | 48.09 | 8.48 | 49.36 | 9.32 | 44.27 | 11.27 | 46.48 | 11.08 | 48.55 | 7.88 | 48.75 | 10.53 |
| PCS | 47.03 | 9.40 | 49.67 | 9.71 | 38.52 | 11.46 | 45.93 | 10.95 | 45.13 | 11.19 | 42.19 | 12.77 |

While the results reported in the main report show differences in the characteristics of the sub-groups, the 95% confidence intervals of the mean overlap for some matched groups for age (thyroid, depressive illness, cancer, Figure A2.1), SF-6D (depressive illness, cancer, Figure A2.2), MCS_12 (thyroid, liver, cancer, Figure A2.3) and PCS_12 (diabetes, thyroid, CHD, cancer, Figure A2.4).

Figure A2.1: Comparing mean age for matched sub-groups in HODaR and Undestanding Society

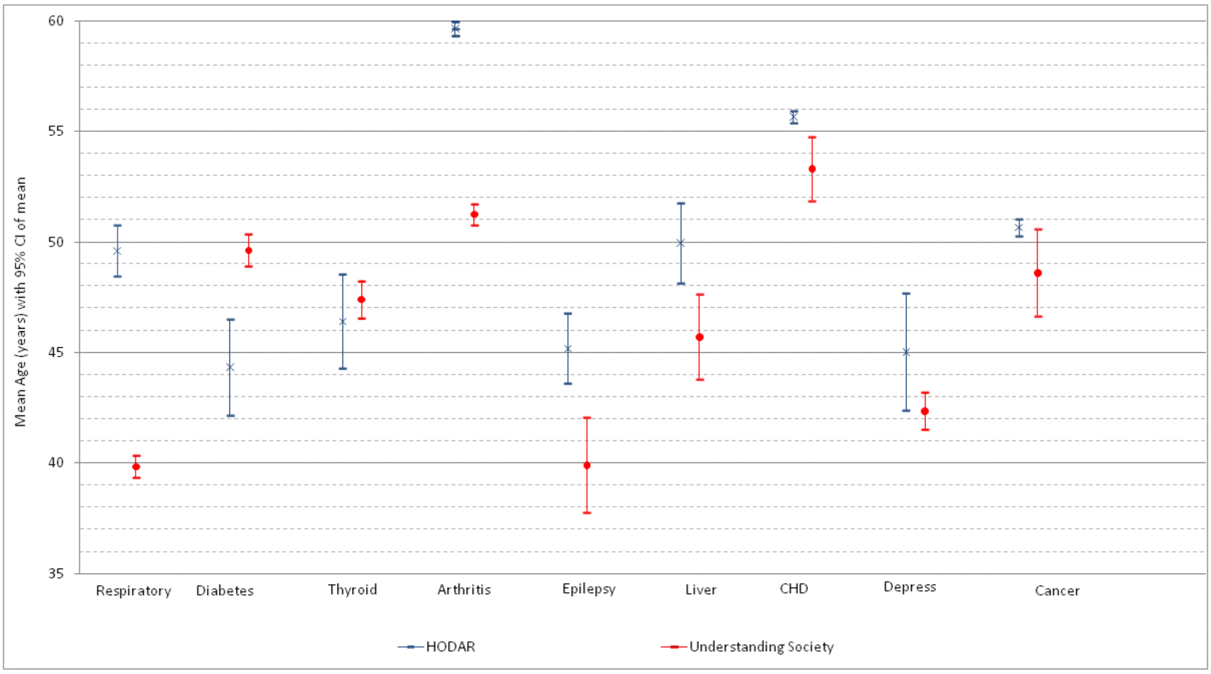



Figure A2.2: Comparing mean SF-6D for matched sub-groups in HODaR and Undestanding Society

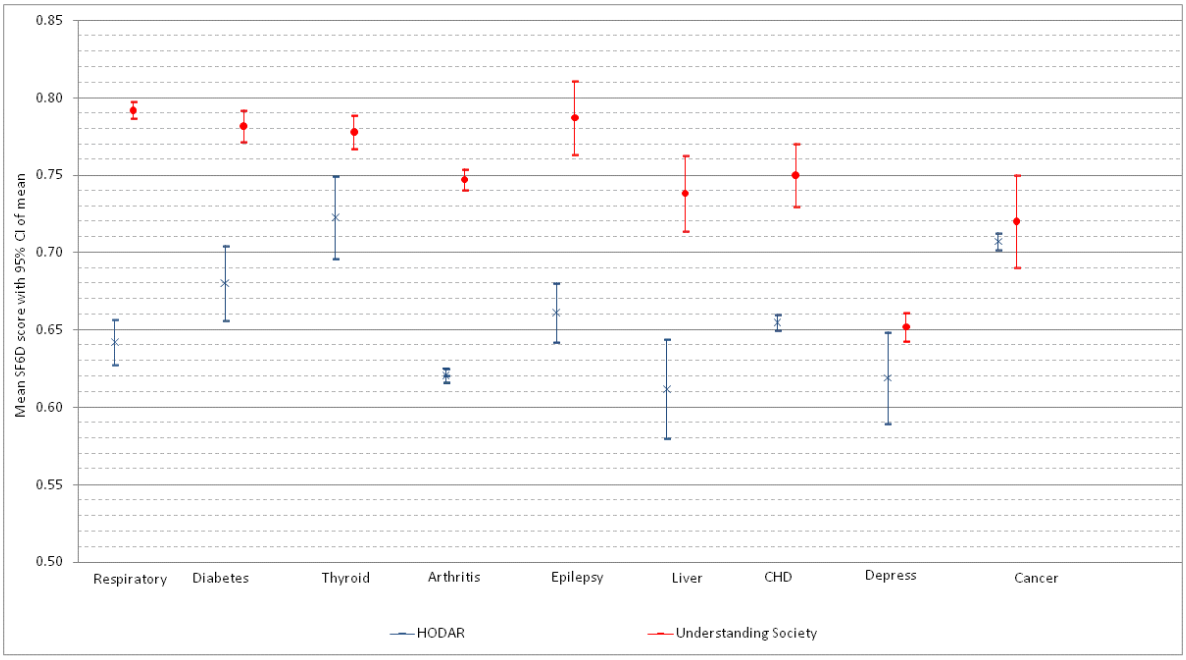


Figure A2.3: Comparing mean MCS_12 for matched sub-groups in HODaR and Undestanding Society

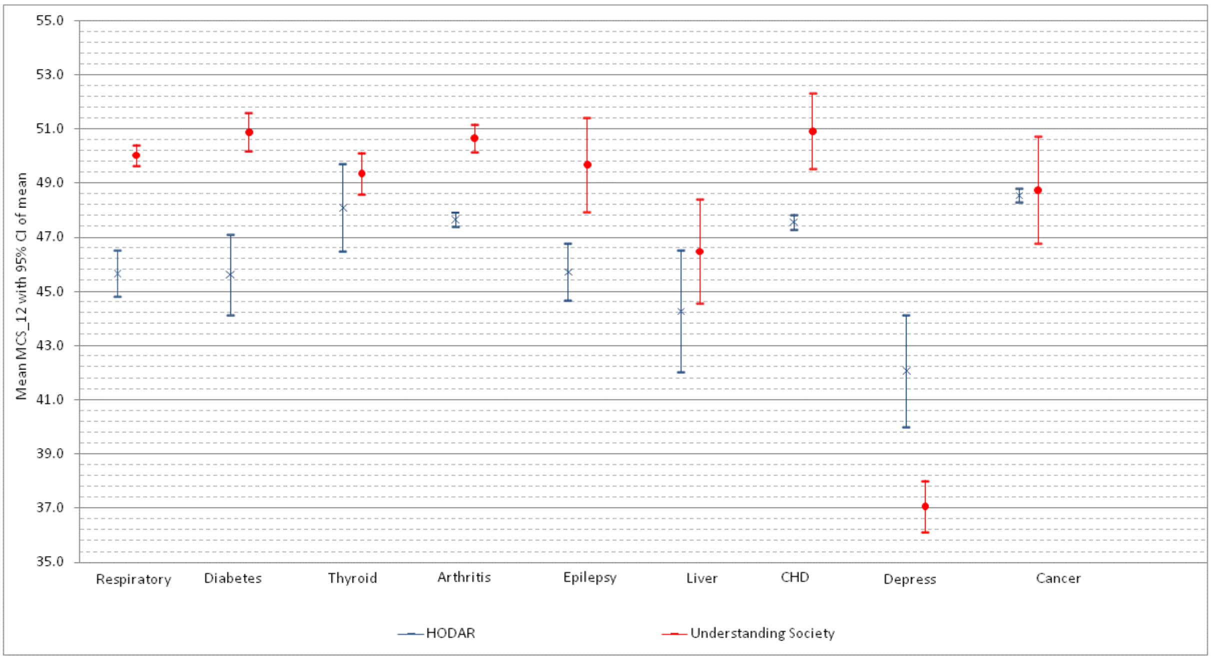
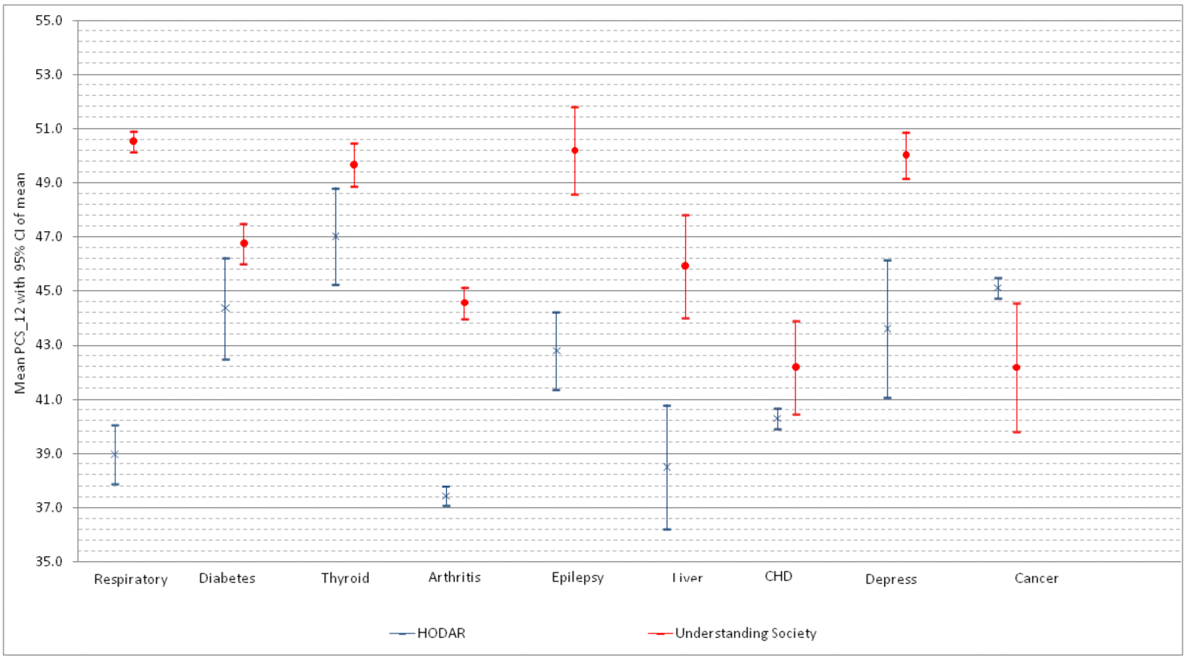



Figure A2.4: Comparing mean PCS_12 for matched sub-groups in HODaR and Undestanding Society



# APPENDIX 3: Additional tables and figures

Table A3.1: Regression models to predict SF-6D, MCS, or PCS scores (using EQ-5D health dimensions)

| | SF-6D Coef. | Robust Std. Err. | P>t | PCS_12 Coef. | Robust Std. Err. | P>t | MCS_12 Coef. | Robust Std. Err. | P>t |
|---|---|---|---|---|---|---|---|---|---|
| Age/10 | 0.0053 | 0.0005 | <0.001 | -0.3081 | 0.0285 | <0.001 | 0.7701 | 0.0282 | <0.001 |
| Sex | -0.0154 | 0.0011 | <0.001 | -0.6485 | 0.0736 | <0.001 | -0.2462 | 0.0712 | 0.001 |
| Mobility | -0.0462 | 0.0016 | <0.001 | -5.9385 | 0.1154 | <0.001 | 0.1827 | 0.1026 | 0.075 |
| Self_Care | -0.0285 | 0.0014 | <0.001 | -4.0015 | 0.1286 | <0.001 | -1.3176 | 0.1192 | <0.001 |
| Usual_Act | -0.0735 | 0.0012 | <0.001 | -6.3047 | 0.0893 | <0.001 | -1.3089 | 0.0848 | <0.001 |
| Pain | -0.0542 | 0.0011 | <0.001 | -4.4361 | 0.0754 | <0.001 | -1.0195 | 0.0733 | <0.001 |
| Anxiety | -0.0906 | 0.0009 | <0.001 | 0.0900 | 0.0683 | 0.188 | -8.6647 | 0.0711 | <0.001 |
| group01 | -0.0328 | 0.0107 | 0.002 | -3.2109 | 0.7726 | <0.001 | -1.1575 | 0.6675 | 0.083 |
| group02 | -0.0373 | 0.0122 | 0.002 | -3.7750 | 0.8929 | <0.001 | -2.0939 | 0.8400 | 0.013 |
| group03 | 0.0341 | 0.0095 | <0.001 | 1.0431 | 0.5328 | 0.050 | 0.6035 | 0.5214 | 0.247 |
| group04 | -0.0252 | 0.0099 | 0.011 | -0.8522 | 0.5896 | 0.148 | -1.2922 | 0.5788 | 0.026 |
| group05 | -0.0308 | 0.0115 | 0.008 | -3.2474 | 0.7193 | <0.001 | -0.8251 | 0.7076 | 0.244 |
| group06 | -0.0214 | 0.0126 | 0.091 | -0.9201 | 0.7351 | 0.211 | -0.1408 | 0.7039 | 0.842 |
| group07 | -0.0224 | 0.0128 | 0.081 | -1.4133 | 0.7722 | 0.067 | -1.3099 | 0.7106 | 0.065 |
| group08 | -0.0090 | 0.0099 | 0.363 | -2.5096 | 0.6203 | <0.001 | -0.6381 | 0.6110 | 0.296 |
| group09 | 0.0085 | 0.0111 | 0.443 | 0.1511 | 0.6504 | 0.816 | -0.1330 | 0.6059 | 0.826 |
| group10 | 0.0182 | 0.0089 | 0.042 | 0.6678 | 0.4990 | 0.181 | 0.0468 | 0.4915 | 0.924 |
| group11 | -0.0090 | 0.0124 | 0.468 | -1.3983 | 0.7013 | 0.046 | -0.3593 | 0.7113 | 0.613 |
| group12 | 0.0124 | 0.0096 | 0.194 | -0.5465 | 0.5601 | 0.329 | 0.4641 | 0.5430 | 0.393 |
| group13 | -0.0004 | 0.0111 | 0.970 | -0.5811 | 0.7360 | 0.430 | -1.3031 | 0.7079 | 0.066 |
| group14 | 0.0152 | 0.0099 | 0.125 | 0.1428 | 0.5644 | 0.800 | 0.0104 | 0.5643 | 0.985 |
| group15 | 0.0162 | 0.0116 | 0.165 | -1.3575 | 0.7184 | 0.059 | 1.1601 | 0.6741 | 0.085 |
| group16 | 0.0027 | 0.0125 | 0.826 | -0.2922 | 0.7058 | 0.679 | -0.9385 | 0.7573 | 0.215 |
| group17 | -0.0085 | 0.0118 | 0.472 | 0.2512 | 0.7501 | 0.738 | -0.9959 | 0.7087 | 0.160 |
| group18 | 0.0090 | 0.0105 | 0.389 | -2.5299 | 0.7898 | 0.001 | 1.7135 | 0.6737 | 0.011 |
| group19 | 0.0086 | 0.0102 | 0.396 | -0.0295 | 0.6023 | 0.961 | -0.3246 | 0.6242 | 0.603 |
| group20 | 0.0225 | 0.0098 | 0.022 | 0.5933 | 0.5617 | 0.291 | 0.7043 | 0.5527 | 0.203 |
| group21 | 0.0069 | 0.0105 | 0.507 | -0.7326 | 0.6747 | 0.278 | 1.2727 | 0.6469 | 0.049 |
| group22 | 0.0229 | 0.0110 | 0.037 | 0.7712 | 0.6556 | 0.239 | -0.2229 | 0.6149 | 0.717 |
| group23 | 0.0298 | 0.0099 | 0.003 | 0.7590 | 0.5559 | 0.172 | 0.0382 | 0.5572 | 0.945 |
| group24 | 0.0024 | 0.0105 | 0.818 | 0.7741 | 0.6056 | 0.201 | -1.0544 | 0.6183 | 0.088 |
| group25 | 0.0112 | 0.0107 | 0.294 | -0.4088 | 0.6190 | 0.509 | -0.1758 | 0.6222 | 0.777 |
| group26 | 0.0282 | 0.0108 | 0.009 | 0.9383 | 0.5956 | 0.115 | 0.3034 | 0.5898 | 0.607 |
| group27 | -0.0097 | 0.0087 | 0.264 | -1.6308 | 0.4923 | 0.001 | -0.1244 | 0.4863 | 0.798 |
| group28 | -0.0128 | 0.0100 | 0.201 | -1.6836 | 0.6064 | 0.005 | -1.0826 | 0.5903 | 0.067 |
| group29 | 0.0243 | 0.0090 | 0.007 | 0.9893 | 0.5077 | 0.051 | -0.1095 | 0.5034 | 0.828 |
| group30 | 0.0085 | 0.0133 | 0.524 | 0.0195 | 0.6552 | 0.976 | -0.1662 | 0.6936 | 0.811 |
| group31 | -0.0071 | 0.0111 | 0.522 | -1.8423 | 0.6451 | 0.004 | -0.8846 | 0.6537 | 0.176 |
| group32 | 0.0085 | 0.0120 | 0.480 | 0.1504 | 0.7684 | 0.845 | -0.0729 | 0.7053 | 0.918 |
| group33 | 0.0315 | 0.0095 | 0.001 | 0.9167 | 0.5214 | 0.079 | -0.0605 | 0.5251 | 0.908 |
| group34 | 0.0073 | 0.0099 | 0.461 | -1.9856 | 0.5917 | 0.001 | -0.7706 | 0.5999 | 0.199 |
| group35 | -0.0020 | 0.0113 | 0.858 | -2.4050 | 0.7312 | 0.001 | 0.2380 | 0.6884 | 0.730 |
| group36 | 0.0139 | 0.0087 | 0.111 | 0.2564 | 0.4964 | 0.605 | 1.4096 | 0.4888 | 0.004 |
| group37 | -0.0043 | 0.0088 | 0.620 | -1.4465 | 0.5051 | 0.004 | 1.2143 | 0.4982 | 0.015 |
| group38 | 0.0150 | 0.0092 | 0.103 | 0.4508 | 0.5198 | 0.386 | 0.7464 | 0.5143 | 0.147 |
| group39 | 0.0123 | 0.0112 | 0.271 | -0.2609 | 0.7318 | 0.721 | 0.4512 | 0.7158 | 0.528 |
| group40 | 0.0115 | 0.0092 | 0.214 | 0.0891 | 0.5212 | 0.864 | -0.1228 | 0.5195 | 0.813 |
| group41 | 0.0293 | 0.0109 | 0.007 | 0.5803 | 0.6141 | 0.345 | 0.7713 | 0.5856 | 0.188 |
| group42 | 0.0130 | 0.0088 | 0.138 | 0.5559 | 0.4906 | 0.257 | -0.1577 | 0.4889 | 0.747 |
| group43 | -0.0003 | 0.0122 | 0.982 | 0.4926 | 0.6971 | 0.480 | -1.3068 | 0.6844 | 0.056 |
| group44 | 0.0081 | 0.0094 | 0.390 | -0.6871 | 0.5577 | 0.218 | -0.1641 | 0.5328 | 0.758 |
| group45 | 0.0155 | 0.0097 | 0.109 | 0.2369 | 0.5582 | 0.671 | -0.0051 | 0.5526 | 0.993 |
| group46 | 0.0070 | 0.0088 | 0.426 | -0.3506 | 0.4967 | 0.480 | -0.4128 | 0.4905 | 0.400 |
| group47 | -0.0088 | 0.0090 | 0.330 | -0.0635 | 0.5240 | 0.904 | -1.5944 | 0.5328 | 0.003 |
| group48 | 0.0093 | 0.0089 | 0.299 | -1.0365 | 0.5142 | 0.044 | 0.6955 | 0.5018 | 0.166 |
| group49 | 0.0125 | 0.0095 | 0.187 | -0.8383 | 0.5540 | 0.130 | 0.1109 | 0.5372 | 0.836 |

| | SF-6D Coef. | Robust Std. Err. | P>t | PCS_12 Coef. | Robust Std. Err. | P>t | MCS_12 Coef. | Robust Std. Err. | P>t |
|---|---|---|---|---|---|---|---|---|---|
| group50 | 0.0313 | 0.0105 | 0.003 | 1.5477 | 0.5862 | 0.008 | -0.6236 | 0.6305 | 0.323 |
| | | | | | | | | | |
| group51 | 0.0127 | 0.0085 | 0.136 | 0.0693 | 0.4774 | 0.885 | -0.1262 | 0.4738 | 0.790 |
| group52 | 0.0223 | 0.0089 | 0.012 | 0.9823 | 0.4960 | 0.048 | 0.1018 | 0.4951 | 0.837 |
| group53 | -0.0008 | 0.0089 | 0.929 | -0.2631 | 0.4998 | 0.599 | 0.6018 | 0.4955 | 0.225 |
| group54 | 0.0218 | 0.0094 | 0.021 | 0.4638 | 0.5309 | 0.382 | 0.4528 | 0.5310 | 0.394 |
| group55 | 0.0263 | 0.0109 | 0.016 | 0.5396 | 0.6320 | 0.393 | 1.2578 | 0.6174 | 0.042 |
| group56 | 0.0154 | 0.0090 | 0.087 | 0.9051 | 0.4917 | 0.066 | -0.4166 | 0.4972 | 0.402 |
| Constant | 1.0999 | 0.0089 | <0.001 | 75.9777 | 0.5008 | <0.001 | 61.9277 | 0.4981 | <0.001 |

Table A3.2: Observed and predicted mean SF-6D (MCS-12, PCS-12) (obtained using the health dimension models)

| | | SF-6D | | PCS_12 | | MCS_12 | | ICD | | SF-6D | | PCS_12 | | MCS_12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ICD group | N | Obs | Pred | Obs | Pred | Obs | Pred | group | N | Obs | Pred | Obs | Pred | Obs | Pred |
| Healthy | 117 | 0.726 | 0.726 | 47.42 | 47.42 | 49.33 | 49.33 | | | | | | | | |
| group1 | 181 | 0.608 | 0.608 | 37.25 | 37.25 | 45.61 | 45.61 | group29 | 940 | 0.736 | 0.736 | 47.25 | 47.25 | 48.84 | 48.84 |
| group2 | 100 | 0.603 | 0.603 | 36.08 | 36.08 | 45.24 | 45.24 | group30 | 108 | 0.760 | 0.760 | 50.22 | 50.22 | 49.31 | 49.31 |
| group3 | 442 | 0.771 | 0.771 | 48.50 | 48.50 | 50.90 | 50.90 | group31 | 207 | 0.667 | 0.667 | 42.03 | 42.03 | 46.37 | 46.37 |
| group4 | 319 | 0.657 | 0.657 | 43.93 | 43.93 | 46.48 | 46.48 | group32 | 121 | 0.660 | 0.660 | 42.82 | 42.82 | 45.97 | 45.97 |
| group5 | 149 | 0.651 | 0.651 | 40.98 | 40.98 | 47.29 | 47.29 | group33 | 476 | 0.774 | 0.774 | 50.11 | 50.11 | 49.32 | 49.32 |
| group6 | 123 | 0.709 | 0.709 | 45.89 | 45.89 | 49.81 | 49.81 | group34 | 347 | 0.636 | 0.636 | 37.63 | 37.63 | 45.57 | 45.57 |
| group7 | 135 | 0.692 | 0.692 | 44.42 | 44.42 | 48.07 | 48.07 | group35 | 175 | 0.651 | 0.651 | 38.84 | 38.84 | 47.48 | 47.48 |
| group8 | 272 | 0.653 | 0.653 | 39.21 | 39.21 | 47.07 | 47.07 | group36 | 1978 | 0.641 | 0.641 | 38.45 | 38.45 | 48.92 | 48.92 |
| group9 | 163 | 0.733 | 0.733 | 47.63 | 47.63 | 49.27 | 49.27 | group37 | 1574 | 0.562 | 0.562 | 33.36 | 33.36 | 45.65 | 45.65 |
| group10 | 1198 | 0.752 | 0.752 | 48.86 | 48.86 | 49.64 | 49.64 | group38 | 752 | 0.686 | 0.686 | 43.15 | 43.15 | 48.77 | 48.77 |
| group11 | 163 | 0.699 | 0.699 | 44.25 | 44.25 | 48.63 | 48.63 | group39 | 165 | 0.616 | 0.616 | 37.72 | 37.72 | 45.83 | 45.83 |
| group12 | 418 | 0.692 | 0.692 | 43.32 | 43.32 | 48.18 | 48.18 | group40 | 747 | 0.701 | 0.701 | 45.01 | 45.01 | 47.74 | 47.74 |
| group13 | 148 | 0.680 | 0.680 | 44.37 | 44.37 | 45.62 | 45.62 | group41 | 220 | 0.764 | 0.764 | 48.58 | 48.58 | 49.97 | 49.97 |
| group14 | 316 | 0.713 | 0.713 | 45.59 | 45.59 | 48.29 | 48.29 | group42 | 1636 | 0.734 | 0.734 | 48.51 | 48.51 | 48.58 | 48.58 |
| group15 | 156 | 0.693 | 0.693 | 42.28 | 42.28 | 48.74 | 48.74 | group43 | 128 | 0.687 | 0.687 | 45.42 | 45.42 | 46.39 | 46.39 |
| group16 | 106 | 0.723 | 0.723 | 47.03 | 47.03 | 48.09 | 48.09 | group44 | 491 | 0.707 | 0.707 | 44.21 | 44.21 | 48.50 | 48.50 |
| group17 | 122 | 0.625 | 0.625 | 43.11 | 43.11 | 43.14 | 43.14 | group45 | 438 | 0.707 | 0.707 | 45.10 | 45.10 | 48.02 | 48.02 |
| group18 | 130 | 0.604 | 0.604 | 33.45 | 33.45 | 47.65 | 47.65 | group46 | 1756 | 0.666 | 0.666 | 42.43 | 42.43 | 46.38 | 46.38 |
| group19 | 271 | 0.661 | 0.661 | 42.81 | 42.81 | 45.72 | 45.72 | group47 | 892 | 0.603 | 0.603 | 40.68 | 40.68 | 42.28 | 42.28 |
| group20 | 397 | 0.703 | 0.703 | 44.37 | 44.37 | 48.91 | 48.91 | group48 | 1022 | 0.684 | 0.684 | 42.09 | 42.09 | 48.60 | 48.60 |
| group21 | 219 | 0.603 | 0.603 | 36.75 | 36.75 | 46.03 | 46.03 | group49 | 528 | 0.690 | 0.690 | 43.03 | 43.03 | 47.69 | 47.69 |
| group22 | 207 | 0.728 | 0.728 | 46.14 | 46.14 | 48.87 | 48.87 | group50 | 234 | 0.763 | 0.763 | 50.93 | 50.93 | 47.64 | 47.64 |
| group23 | 349 | 0.748 | 0.748 | 46.51 | 46.51 | 49.85 | 49.85 | group51 | 5845 | 0.702 | 0.702 | 45.15 | 45.15 | 47.73 | 47.73 |
| group24 | 224 | 0.733 | 0.733 | 47.78 | 47.78 | 48.97 | 48.97 | group52 | 1317 | 0.723 | 0.723 | 46.88 | 46.88 | 48.22 | 48.22 |
| group25 | 209 | 0.723 | 0.723 | 45.92 | 45.92 | 48.66 | 48.66 | group53 | 1549 | 0.673 | 0.673 | 43.17 | 43.17 | 48.24 | 48.24 |
| group26 | 224 | 0.763 | 0.763 | 49.39 | 49.39 | 49.60 | 49.60 | group54 | 517 | 0.732 | 0.732 | 46.36 | 46.36 | 49.43 | 49.43 |
| group27 | 2297 | 0.648 | 0.648 | 39.74 | 39.74 | 47.45 | 47.45 | group55 | 223 | 0.686 | 0.686 | 42.31 | 42.31 | 48.84 | 48.84 |
| group28 | 305 | 0.634 | 0.634 | 39.90 | 39.90 | 45.33 | 45.33 | group56 | 1280 | 0.777 | 0.777 | 52.78 | 52.78 | 48.78 | 48.78 |

**Table A3.3: Regression models to predict SF-6D, MCS or PCS scores (using EQ-5D preference scores)**

| | SF-6D | | | MCS | | | PCS | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coef. | 95% Conf. Interval | P>t | Coef. | 95% Conf. Interval | P>t | Coef | 95% Conf. Interval | P>t |
| Age/10 | 0.0031 | (0.0021 to 0.0041) | <0.001 | 1.0463 | (0.9827 to 1.1100) | <0.001 | -0.8967 | (-0.9631 to -0.8304) | <0.001 |
| Female | -0.0164 | (-0.0189 to -0.0139) | <0.001 | -0.3638 | (-0.5260 to -0.2017) | <0.001 | -0.5284 | (-0.7019 to -0.3549) | <0.001 |
| EQ-5D | 0.3664 | (0.3630 to 0.3698) | <0.001 | 15.4859 | (15.2035 to 15.7683) | <0.001 | 24.6795 | (24.4046 to 24.9544) | <0.001 |
| Group01 | -0.056 | (-0.0786 to -0.0335) | <0.001 | -1.8756 | (-3.4074 to -0.3439) | 0.016 | -4.6293 | (-6.3586 to -2.9001) | <0.001 |
| Group02 | -0.064 | (-0.0909 to -0.0371) | <0.001 | -2.2881 | (-4.1662 to -0.4099) | 0.017 | -6.2497 | (-8.3223 to -4.1771) | <0.001 |
| Group03 | 0.0422 | (0.0215 to 0.0630) | <0.001 | 0.7621 | (-0.5043 to 2.0285) | 0.238 | 1.9065 | (0.6092 to 3.2038) | 0.004 |
| Group04 | -0.0365 | (-0.0578 to -0.0153) | 0.001 | -2.1675 | (-3.5298 to -0.8052) | 0.002 | -0.7471 | (-2.1427 to 0.6485) | 0.294 |
| Group05 | -0.0404 | (-0.0649 to -0.0160) | 0.001 | -1.1907 | (-2.8014 to 0.4201) | 0.147 | -3.7135 | (-5.3588 to -2.0682) | <0.001 |
| Group06 | -0.027 | (-0.0544 to 0.0004) | 0.054 | -0.5358 | (-2.1703 to 1.0987) | 0.521 | -0.7749 | (-2.4846 to 0.9347) | 0.374 |
| Group07 | -0.0212 | (-0.0486 to 0.0062) | 0.13 | -1.687 | (-3.3316 to -0.0424) | 0.044 | -0.6145 | (-2.4859 to 1.2568) | 0.52 |
| Group08 | -0.025 | (-0.0468 to -0.0032) | 0.024 | -0.6011 | (-2.0180 to 0.8158) | 0.406 | -4.2651 | (-5.7565 to -2.7737) | <0.001 |
| Group09 | 0.0085 | (-0.0159 to 0.0329) | 0.494 | -0.1541 | (-1.6193 to 1.3111) | 0.837 | 0.314 | (-1.2387 to 1.8668) | 0.692 |
| Group10 | 0.027 | (0.0076 to 0.0463) | 0.006 | 0.3734 | (-0.8213 to 1.5682) | 0.54 | 1.405 | (0.1975 to 2.6124) | 0.023 |
| Group11 | -0.0102 | (-0.0369 to 0.0165) | 0.454 | -0.2303 | (-1.9018 to 1.4412) | 0.787 | -1.5722 | (-3.2694 to 0.1251) | 0.069 |
| Group12 | 0.0159 | (-0.0050 to 0.0368) | 0.136 | 0.922 | (-0.4114 to 2.2554) | 0.175 | -0.5661 | (-1.9433 to 0.8111) | 0.42 |
| Group13 | -0.005 | (-0.0294 to 0.0195) | 0.691 | -1.7194 | (-3.4110 to -0.0278) | 0.046 | -0.4332 | (-2.2122 to 1.3459) | 0.633 |
| Group14 | 0.0153 | (-0.0061 to 0.0368) | 0.162 | 0.0977 | (-1.2583 to 1.4537) | 0.888 | 0.1914 | (-1.1797 to 1.5624) | 0.784 |
| Group15 | 0.0087 | (-0.0173 to 0.0346) | 0.513 | 1.7551 | (0.2130 to 3.2972) | 0.026 | -2.8307 | (-4.5576 to -1.1038) | 0.001 |
| Group16 | 0.0039 | (-0.0240 to 0.0318) | 0.785 | -0.9688 | (-2.7773 to 0.8398) | 0.294 | 0.0216 | (-1.7083 to 1.7514) | 0.981 |
| Group17 | -0.0214 | (-0.0472 to 0.0043) | 0.102 | -2.6172 | (-4.3437 to -0.8907) | 0.003 | 1.0556 | (-0.8283 to 2.9394) | 0.272 |
| Group18 | -0.0196 | (-0.0428 to 0.0036) | 0.098 | 3.0227 | (1.3725 to 4.6728) | <0.001 | -7.5451 | (-9.4375 to -5.6528) | <0.001 |
| Group19 | 0.0013 | (-0.0208 to 0.0234) | 0.909 | -0.6319 | (-2.1107 to 0.8469) | 0.402 | -0.1892 | (-1.6382 to 1.2598) | 0.798 |
| Group20 | 0.0274 | (0.0062 to 0.0486) | 0.011 | 1.2966 | (-0.0418 to 2.6351) | 0.058 | 0.8216 | (-0.5170 to 2.1602) | 0.229 |
| Group21 | -0.0068 | (-0.0301 to 0.0165) | 0.567 | 1.8191 | (0.2587 to 3.3794) | 0.022 | -2.9989 | (-4.6129 to -1.3848) | <0.001 |
| Group22 | 0.0285 | (0.0044 to 0.0525) | 0.021 | 0.3601 | (-1.1400 to 1.8603) | 0.638 | 0.9263 | (-0.6260 to 2.4786) | 0.242 |
| Group23 | 0.0408 | (0.0193 to 0.0622) | <0.001 | 0.3977 | (-0.9356 to 1.7311) | 0.559 | 1.6825 | (0.3254 to 3.0396) | 0.015 |
| Group24 | 0.0044 | (-0.0184 to 0.0272) | 0.708 | -0.9829 | (-2.4182 to 0.4524) | 0.18 | 1.1024 | (-0.3240 to 2.5288) | 0.13 |
| Group25 | 0.0127 | (-0.0109 to 0.0364) | 0.292 | -0.1649 | (-1.6526 to 1.3228) | 0.828 | -0.1267 | (-1.6343 to 1.3810) | 0.869 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Group26 | 0.0404 | (0.0169 to 0.0638) | 0.001 | 0.5577 | (-0.8476 to 1.9630) | 0.437 | 2.1756 | (0.7734 to 3.5778) | 0.002 |
| Group27 | -0.0255 | (-0.0443 to -0.0067) | 0.008 | -0.4436 | (-1.6248 to 0.7376) | 0.462 | -2.7245 | (-3.9150 to -1.5340) | <0.001 |
| Group28 | -0.0288 | (-0.0506 to -0.0069) | 0.01 | -1.8314 | (-3.2305 to -0.4323) | 0.01 | -2.4371 | (-3.9327 to -0.9416) | 0.001 |
| Group29 | 0.0281 | (0.0085 to 0.0477) | 0.005 | 0.0624 | (-1.1484 to 1.2731) | 0.92 | 1.3949 | (0.1704 to 2.6194) | 0.026 |
| Group30 | 0.0209 | (-0.0085 to 0.0503) | 0.164 | 0.5718 | (-1.1393 to 2.2829) | 0.512 | 0.4844 | (-1.0823 to 2.0512) | 0.544 |
| Group31 | -0.0071 | (-0.0312 to 0.0169) | 0.561 | -0.9091 | (-2.4068 to 0.5886) | 0.234 | -1.6271 | (-3.1546 to -0.0995) | 0.037 |
| Group32 | 0.0047 | (-0.0207 to 0.0301) | 0.715 | -0.5233 | (-2.2326 to 1.1861) | 0.549 | 0.3981 | (-1.4079 to 2.2041) | 0.666 |
| Group33 | 0.0429 | (0.0222 to 0.0636) | <0.001 | 0.2889 | (-0.9882 to 1.5659) | 0.657 | 1.8934 | (0.6344 to 3.1525) | 0.003 |
| Group34 | -0.0089 | (-0.0306 to 0.0128) | 0.419 | -0.6311 | (-2.0361 to 0.7739) | 0.379 | -3.887 | (-5.3241 to -2.4499) | <0.001 |
| Group35 | -0.0121 | (-0.0371 to 0.0129) | 0.342 | 0.8199 | (-0.7725 to 2.4122) | 0.313 | -3.9735 | (-5.6829 to -2.2640) | <0.001 |
| Group36 | 0.0051 | (-0.0138 to 0.0239) | 0.598 | 3.0384 | (1.8512 to 4.2256) | <0.001 | -2.3949 | (-3.5922 to -1.1977) | <0.001 |
| Group37 | -0.0107 | (-0.0297 to 0.0083) | 0.269 | 2.7012 | (1.4925 to 3.9099) | <0.001 | -3.4941 | (-4.7125 to -2.2758) | <0.001 |
| Group38 | 0.0183 | (-0.0017 to 0.0384) | 0.072 | 1.4881 | (0.2424 to 2.7337) | 0.019 | 0.2659 | (-0.9899 to 1.5216) | 0.678 |
| Group39 | 0.0063 | (-0.0188 to 0.0315) | 0.621 | 1.5956 | (-0.0738 to 3.2650) | 0.061 | -1.9591 | (-3.5908 to -0.3274) | 0.019 |
| Group40 | 0.0139 | (-0.0060 to 0.0339) | 0.171 | 0.0747 | (-1.1724 to 1.3217) | 0.907 | 0.396 | (-0.8654 to 1.6575) | 0.538 |
| Group41 | 0.0421 | (0.0189 to 0.0654) | <0.001 | 0.8709 | (-0.5351 to 2.2769) | 0.225 | 2.0181 | (0.5461 to 3.4901) | 0.007 |
| Group42 | 0.0215 | (0.0025 to 0.0405) | 0.026 | -0.061 | (-1.2474 to 1.1253) | 0.92 | 1.6068 | (0.4180 to 2.7956) | 0.008 |
| Group43 | -0.0028 | (-0.0297 to 0.0241) | 0.839 | -1.1611 | (-2.8161 to 0.4938) | 0.169 | 0.2262 | (-1.4137 to 1.8661) | 0.787 |
| Group44 | 0.0069 | (-0.0138 to 0.0276) | 0.516 | -0.3042 | (-1.5832 to 0.9748) | 0.641 | -0.5424 | (-1.8960 to 0.8112) | 0.432 |
| Group45 | 0.0127 | (-0.0083 to 0.0337) | 0.236 | -0.0911 | (-1.4090 to 1.2268) | 0.892 | 0.1659 | (-1.1733 to 1.5051) | 0.808 |
| Group46 | 0.0008 | (-0.0181 to 0.0198) | 0.932 | -0.5691 | (-1.7635 to 0.6253) | 0.35 | -0.5374 | (-1.7395 to 0.6647) | 0.381 |
| Group47 | -0.0176 | (-0.0371 to 0.0018) | 0.076 | -2.3566 | (-3.6616 to -1.0517) | <0.001 | 0.1523 | (-1.1337 to 1.4382) | 0.816 |
| Group48 | -0.0008 | (-0.0201 to 0.0186) | 0.939 | 0.5948 | (-0.6169 to 1.8066) | 0.336 | -1.8065 | (-3.0520 to -0.5610) | 0.004 |
| Group49 | 0.012 | (-0.0085 to 0.0326) | 0.252 | 0.2065 | (-1.0814 to 1.4943) | 0.753 | -0.7034 | (-2.0434 to 0.6366) | 0.304 |
| Group50 | 0.0414 | (0.0186 to 0.0642) | <0.001 | -0.637 | (-2.1660 to 0.8919) | 0.414 | 2.7809 | (1.3550 to 4.2068) | <0.001 |
| Group51 | 0.0157 | (-0.0028 to 0.0341) | 0.096 | -0.0071 | (-1.1636 to 1.1493) | 0.99 | 0.5806 | (-0.5774 to 1.7386) | 0.326 |
| Group52 | 0.0273 | (0.0081 to 0.0465) | 0.005 | 0.3828 | (-0.8204 to 1.5860) | 0.533 | 1.4161 | (0.2149 to 2.6173) | 0.021 |
| Group53 | -0.0117 | (-0.0309 to 0.0075) | 0.231 | 1.2996 | (0.0958 to 2.5033) | 0.034 | -1.9972 | (-3.2051 to -0.7893) | 0.001 |
| Group54 | 0.0262 | (0.0057 to 0.0467) | 0.012 | 0.5337 | (-0.7487 to 1.8161) | 0.415 | 1.1281 | (-0.1692 to 2.4253) | 0.088 |
| Group55 | 0.0218 | (-0.0018 to 0.0454) | 0.07 | 2.5512 | (1.1129 to 3.9895) | 0.001 | -1.2728 | (-2.7608 to 0.2152) | 0.094 |
| Group56 | 0.0292 | (0.0099 to 0.0485) | 0.003 | -0.2264 | (-1.4300 to 0.9773) | 0.712 | 2.1549 | (0.9686 to 3.3412) | <0.001 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Constant | 0.4242 | (0.4050 to 0.4435) | <0.001 | 32.0884 | (30.8646 to 33.3123) | <0.001 | 31.8314 | (30.6103 to 33.0524) | <0.001 |

**Table A3.4 : Observed (Obs) and predicted mean SF-6D**

| ICD group | N | Obs | Predicted using Health dimensions | Predicted Using Preference-based index | ICD group | N | Obs | Predicted using Health dimensions | Predicted using Preference-based index |
|---|---|---|---|---|---|---|---|---|---|
| Healthy | 117 | 0.72617 | 0.72617 | 0.72617 | | | | | |
| group1 | 181 | 0.60767 | 0.60767 | 0.60767 | group29 | 940 | 0.73630 | 0.73630 | 0.73630 |
| group2 | 100 | 0.60252 | 0.60252 | 0.60252 | group30 | 108 | 0.76009 | 0.76009 | 0.76009 |
| group3 | 442 | 0.77104 | 0.77104 | 0.77104 | group31 | 207 | 0.66738 | 0.66738 | 0.66738 |
| group4 | 319 | 0.65680 | 0.65680 | 0.65680 | group32 | 121 | 0.66033 | 0.66033 | 0.66033 |
| group5 | 149 | 0.65133 | 0.65133 | 0.65133 | group33 | 476 | 0.77405 | 0.77405 | 0.77405 |
| group6 | 123 | 0.70868 | 0.70868 | 0.70868 | group34 | 347 | 0.63570 | 0.63570 | 0.63570 |
| group7 | 135 | 0.69237 | 0.69237 | 0.69237 | group35 | 175 | 0.65073 | 0.65073 | 0.65073 |
| group8 | 272 | 0.65283 | 0.65283 | 0.65283 | group36 | 1978 | 0.64150 | 0.64150 | 0.64150 |
| group9 | 163 | 0.73267 | 0.73267 | 0.73267 | group37 | 1574 | 0.56186 | 0.56186 | 0.56186 |
| group10 | 1198 | 0.75245 | 0.75245 | 0.75245 | group38 | 752 | 0.68645 | 0.68645 | 0.68645 |
| group11 | 163 | 0.69948 | 0.69948 | 0.69948 | group39 | 165 | 0.61646 | 0.61646 | 0.61646 |
| group12 | 418 | 0.69186 | 0.69186 | 0.69186 | group40 | 747 | 0.70066 | 0.70066 | 0.70066 |
| group13 | 148 | 0.68018 | 0.68018 | 0.68018 | group41 | 220 | 0.76418 | 0.76418 | 0.76418 |
| group14 | 316 | 0.71301 | 0.71301 | 0.71301 | group42 | 1636 | 0.73364 | 0.73364 | 0.73364 |
| group15 | 156 | 0.69257 | 0.69257 | 0.69257 | group43 | 128 | 0.68745 | 0.68745 | 0.68745 |
| group16 | 106 | 0.72262 | 0.72262 | 0.72262 | group44 | 491 | 0.70674 | 0.70674 | 0.70674 |
| group17 | 122 | 0.62499 | 0.62499 | 0.62499 | group45 | 438 | 0.70656 | 0.70656 | 0.70656 |
| group18 | 130 | 0.60398 | 0.60398 | 0.60398 | group46 | 1756 | 0.66628 | 0.66628 | 0.66628 |
| group19 | 271 | 0.66128 | 0.66128 | 0.66128 | group47 | 892 | 0.60280 | 0.60280 | 0.60280 |
| group20 | 397 | 0.70288 | 0.70288 | 0.70288 | group48 | 1022 | 0.68427 | 0.68427 | 0.68427 |
| group21 | 219 | 0.60341 | 0.60341 | 0.60341 | group49 | 528 | 0.68991 | 0.68991 | 0.68991 |
| group22 | 207 | 0.72844 | 0.72844 | 0.72844 | group50 | 234 | 0.76307 | 0.76307 | 0.76307 |
| group23 | 349 | 0.74781 | 0.74781 | 0.74781 | group51 | 5845 | 0.70242 | 0.70242 | 0.70242 |
| group24 | 224 | 0.73288 | 0.73288 | 0.73288 | group52 | 1317 | 0.72266 | 0.72266 | 0.72266 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| group25 | 209 | 0.72327 | 0.72327 | 0.72327 | group53 | 1549 | 0.67344 | 0.67344 | 0.67344 |
| group26 | 224 | 0.76251 | 0.76251 | 0.76251 | group54 | 517 | 0.73199 | 0.73199 | 0.73199 |
| group27 | 2297 | 0.64800 | 0.64800 | 0.64800 | group55 | 223 | 0.68586 | 0.68586 | 0.68586 |
| group28 | 305 | 0.63376 | 0.63376 | 0.63376 | group56 | 1280 | 0.77674 | 0.77674 | 0.77674 |

**Table A3.5: Observed and predicted mean SF-6D, PCS and MCS values by EQ-5D score**

| ICD Group EQ-5D < 0.5 | N | SF-6D | | PCS | | MCS | |
|---|---|---|---|---|---|---|---|
| | | Observed | Predicted | Observed | Predicted | Observed | Predicted |
| 1 | 38 | 0.49 | 0.43 | 27.81 | 25.34 | 39.63 | 38.27 |
| 2 | 16 | 0.55 | 0.44 | 30.29 | 25.79 | 43.00 | 38.30 |
| 3 | 30 | 0.52 | 0.52 | 31.56 | 31.49 | 42.86 | 40.51 |
| 4 | 32 | 0.50 | 0.43 | 29.45 | 29.05 | 39.37 | 36.82 |
| 5 | 20 | 0.48 | 0.44 | 27.00 | 26.86 | 39.58 | 38.52 |
| 6 | 10 | 0.54 | 0.52 | 33.48 | 33.40 | 43.84 | 41.62 |
| 7 | 11 | 0.51 | 0.47 | 32.56 | 29.88 | 38.50 | 38.52 |
| 8 | 54 | 0.50 | 0.46 | 26.65 | 26.30 | 41.30 | 39.25 |
| 9 | 9 | 0.49 | 0.47 | 31.88 | 29.40 | 37.87 | 38.48 |
| 10 | 93 | 0.52 | 0.50 | 34.76 | 31.95 | 39.18 | 39.33 |
| 11 | 17 | 0.50 | 0.45 | 28.10 | 26.93 | 41.63 | 38.60 |
| 12 | 83 | 0.51 | 0.47 | 30.56 | 28.46 | 41.08 | 38.82 |
| 13 | 29 | 0.54 | 0.50 | 36.25 | 32.43 | 38.41 | 37.99 |
| 14 | 40 | 0.50 | 0.46 | 30.89 | 28.37 | 38.54 | 37.56 |
| 15 | 20 | 0.50 | 0.46 | 25.05 | 26.03 | 42.60 | 39.46 |
| 16 | 8 | 0.54 | 0.46 | 33.95 | 29.62 | 36.27 | 36.87 |
| 17 | 36 | 0.53 | 0.45 | 35.60 | 31.07 | 36.34 | 36.04 |
| 18 | 34 | 0.51 | 0.45 | 28.36 | 22.71 | 43.03 | 41.54 |
| 19 | 64 | 0.50 | 0.45 | 29.68 | 28.79 | 40.05 | 37.12 |
| 20 | 68 | 0.51 | 0.48 | 30.83 | 29.44 | 41.46 | 39.91 |
| 21 | 80 | 0.52 | 0.46 | 28.44 | 26.29 | 43.75 | 40.11 |
| 22 | 29 | 0.54 | 0.49 | 31.94 | 29.95 | 42.00 | 38.80 |
| 23 | 46 | 0.49 | 0.49 | 28.65 | 29.58 | 39.26 | 39.02 |
| 24 | 16 | 0.45 | 0.47 | 29.80 | 30.32 | 32.12 | 38.08 |
| 25 | 23 | 0.49 | 0.48 | 29.21 | 29.16 | 37.51 | 38.28 |
| 26 | 22 | 0.51 | 0.52 | 35.81 | 32.41 | 38.63 | 39.65 |
| 27 | 427 | 0.49 | 0.44 | 28.34 | 25.93 | 39.34 | 38.69 |
| 28 | 65 | 0.49 | 0.43 | 27.73 | 26.17 | 37.71 | 36.96 |
| 29 | 102 | 0.50 | 0.48 | 31.60 | 29.90 | 37.46 | 38.28 |
| 30 | 5 | 0.51 | 0.45 | 25.00 | 27.98 | 47.82 | 37.86 |
| 31 | 44 | 0.49 | 0.44 | 29.34 | 26.76 | 36.44 | 36.93 |
| 32 | 32 | 0.49 | 0.45 | 31.19 | 28.17 | 38.22 | 37.24 |
| 33 | 40 | 0.54 | 0.52 | 35.56 | 32.42 | 40.05 | 39.38 |
| 34 | 84 | 0.48 | 0.44 | 27.33 | 23.85 | 37.35 | 37.46 |
| 35 | 40 | 0.51 | 0.48 | 28.06 | 26.92 | 42.84 | 40.33 |
| 36 | 492 | 0.50 | 0.45 | 28.20 | 25.71 | 42.66 | 41.12 |
| 37 | 705 | 0.47 | 0.42 | 26.28 | 23.72 | 40.95 | 39.66 |
| 38 | 163 | 0.50 | 0.48 | 30.59 | 29.03 | 40.33 | 39.90 |
| 39 | 65 | 0.49 | 0.46 | 27.33 | 26.72 | 40.90 | 39.63 |
| 40 | 122 | 0.52 | 0.47 | 32.37 | 29.40 | 39.50 | 38.24 |
| 41 | 32 | 0.52 | 0.53 | 36.10 | 32.39 | 38.28 | 40.00 |
| 42 | 157 | 0.51 | 0.49 | 35.88 | 32.09 | 38.32 | 37.99 |
| 43 | 18 | 0.49 | 0.47 | 30.07 | 30.88 | 39.30 | 37.40 |
| 44 | 69 | 0.50 | 0.48 | 28.53 | 28.96 | 40.30 | 38.96 |
| 45 | 57 | 0.48 | 0.46 | 29.06 | 28.80 | 37.44 | 37.90 |
| 46 | 367 | 0.49 | 0.45 | 30.14 | 27.97 | 38.13 | 37.46 |
| 47 | 327 | 0.49 | 0.45 | 32.87 | 29.93 | 35.19 | 35.74 |
| 48 | 165 | 0.50 | 0.47 | 29.14 | 27.31 | 40.50 | 39.61 |
| 49 | 104 | 0.49 | 0.46 | 29.82 | 27.66 | 37.58 | 38.17 |
| 50 | 29 | 0.55 | 0.55 | 42.57 | 36.08 | 34.49 | 38.94 |
| 51 | 969 | 0.50 | 0.47 | 31.51 | 29.63 | 38.57 | 38.24 |
| 52 | 209 | 0.50 | 0.48 | 32.16 | 30.55 | 39.11 | 38.19 |
| 53 | 253 | 0.51 | 0.48 | 32.06 | 29.82 | 41.61 | 40.41 |
| 54 | 67 | 0.51 | 0.50 | 31.32 | 30.50 | 39.60 | 39.44 |
| 55 | 46 | 0.47 | 0.47 | 27.01 | 26.94 | 41.22 | 40.03 |
| 56 | 57 | 0.53 | 0.52 | 41.40 | 35.67 | 34.58 | 37.52 |

| ICD Group<br>0.5 <= EQ-5D < 0.69 | N | SF-6D | | PCS | | MCS | |
|---|---|---|---|---|---|---|---|
| | | Observed | Predicted | Observed | Predicted | Observed | Predicted |
| 1 | 62 | 0.58 | 0.61 | 34.93 | 37.21 | 44.6 | 45.56 |
| 2 | 32 | 0.50 | 0.59 | 29.66 | 34.83 | 40.23 | 44.80 |
| 3 | 55 | 0.60 | 0.70 | 37.16 | 43.72 | 46.67 | 47.94 |
| 4 | 78 | 0.58 | 0.63 | 38.85 | 41.70 | 43.13 | 45.33 |
| 5 | 34 | 0.56 | 0.61 | 35.76 | 38.34 | 43.33 | 45.83 |
| 6 | 21 | 0.56 | 0.65 | 38.90 | 42.05 | 43.39 | 47.27 |
| 7 | 31 | 0.56 | 0.65 | 34.98 | 41.39 | 42.06 | 46.13 |
| 8 | 64 | 0.55 | 0.63 | 32.61 | 37.40 | 43.53 | 45.97 |
| 9 | 26 | 0.57 | 0.67 | 39.50 | 43.21 | 43.18 | 46.84 |
| 10 | 125 | 0.57 | 0.68 | 38.37 | 43.92 | 43.18 | 47.09 |
| 11 | 24 | 0.57 | 0.65 | 34.51 | 40.69 | 44.28 | 46.63 |
| 12 | 61 | 0.58 | 0.67 | 35.94 | 41.13 | 44.85 | 47.31 |
| 13 | 27 | 0.56 | 0.64 | 35.37 | 41.21 | 41.04 | 44.58 |
| 14 | 52 | 0.58 | 0.66 | 36.68 | 42.05 | 43.82 | 46.51 |
| 15 | 30 | 0.56 | 0.66 | 34.56 | 40.11 | 44.41 | 47.50 |
| 16 | 16 | 0.59 | 0.67 | 40.27 | 43.37 | 43.66 | 45.72 |
| 17 | 28 | 0.55 | 0.64 | 37.89 | 43.86 | 43.21 | 43.85 |
| 18 | 49 | 0.58 | 0.62 | 30.82 | 34.89 | 46.91 | 48.22 |
| 19 | 60 | 0.59 | 0.66 | 38.64 | 42.29 | 43.19 | 45.99 |
| 20 | 65 | 0.61 | 0.68 | 39.22 | 43.01 | 46.12 | 48.16 |
| 21 | 59 | 0.57 | 0.64 | 34.39 | 39.02 | 45.14 | 47.74 |
| 22 | 29 | 0.57 | 0.69 | 36.47 | 43.00 | 43.36 | 47.60 |
| 23 | 40 | 0.59 | 0.70 | 35.12 | 42.96 | 44.69 | 47.93 |
| 24 | 28 | 0.60 | 0.67 | 37.64 | 42.90 | 45.83 | 46.61 |
| 25 | 30 | 0.59 | 0.67 | 37.79 | 42.12 | 44.96 | 46.77 |
| 26 | 15 | 0.57 | 0.70 | 39.36 | 45.15 | 40.20 | 47.39 |
| 27 | 615 | 0.57 | 0.64 | 35.35 | 38.95 | 44.10 | 46.97 |
| 28 | 69 | 0.55 | 0.63 | 32.07 | 39.35 | 44.31 | 44.99 |
| 29 | 125 | 0.58 | 0.69 | 36.82 | 43.42 | 45.31 | 47.11 |
| 30 | 8 | 0.53 | 0.67 | 34.57 | 42.62 | 44.80 | 46.83 |
| 31 | 31 | 0.56 | 0.65 | 35.81 | 40.43 | 43.06 | 45.84 |
| 32 | 13 | 0.61 | 0.66 | 39.61 | 42.24 | 44.85 | 46.71 |
| 33 | 44 | 0.59 | 0.71 | 38.97 | 44.93 | 42.91 | 46.94 |
| 34 | 94 | 0.55 | 0.64 | 32.63 | 37.74 | 42.95 | 45.76 |
| 35 | 39 | 0.54 | 0.64 | 31.90 | 37.91 | 44.14 | 47.09 |
| 36 | 479 | 0.58 | 0.65 | 35.14 | 39.05 | 46.99 | 49.66 |
| 37 | 356 | 0.55 | 0.64 | 33.45 | 38.47 | 45.76 | 48.96 |
| 38 | 140 | 0.58 | 0.68 | 37.83 | 42.62 | 45.68 | 48.56 |
| 39 | 29 | 0.56 | 0.66 | 34.36 | 40.03 | 44.83 | 47.88 |
| 40 | 118 | 0.59 | 0.67 | 38.30 | 42.86 | 44.04 | 46.71 |
| 41 | 18 | 0.60 | 0.71 | 39.42 | 43.81 | 45.31 | 48.31 |
| 42 | 165 | 0.58 | 0.68 | 38.91 | 44.53 | 43.11 | 46.33 |
| 43 | 25 | 0.56 | 0.65 | 41.36 | 42.35 | 40.30 | 45.07 |
| 44 | 86 | 0.56 | 0.66 | 34.21 | 41.27 | 43.76 | 46.66 |
| 45 | 83 | 0.59 | 0.67 | 36.99 | 41.92 | 44.97 | 46.61 |
| 46 | 360 | 0.58 | 0.66 | 36.70 | 41.60 | 43.60 | 46.31 |
| 47 | 166 | 0.56 | 0.64 | 36.69 | 42.46 | 42.06 | 44.05 |
| 48 | 204 | 0.58 | 0.66 | 35.10 | 40.02 | 44.63 | 47.66 |
| 49 | 77 | 0.57 | 0.67 | 35.86 | 41.33 | 43.59 | 47.21 |
| 50 | 17 | 0.58 | 0.70 | 39.33 | 45.38 | 43.06 | 45.92 |
| 51 | 872 | 0.58 | 0.67 | 37.97 | 43.08 | 43.57 | 46.73 |
| 52 | 163 | 0.59 | 0.68 | 38.27 | 43.82 | 44.26 | 46.98 |
| 53 | 289 | 0.56 | 0.64 | 37.06 | 40.87 | 43.57 | 47.31 |
| 54 | 71 | 0.58 | 0.69 | 36.80 | 43.33 | 44.15 | 47.95 |
| 55 | 38 | 0.58 | 0.67 | 37.81 | 41.00 | 44.50 | 48.52 |
| 56 | 36 | 0.60 | 0.69 | 41.50 | 46.95 | 42.54 | 44.95 |

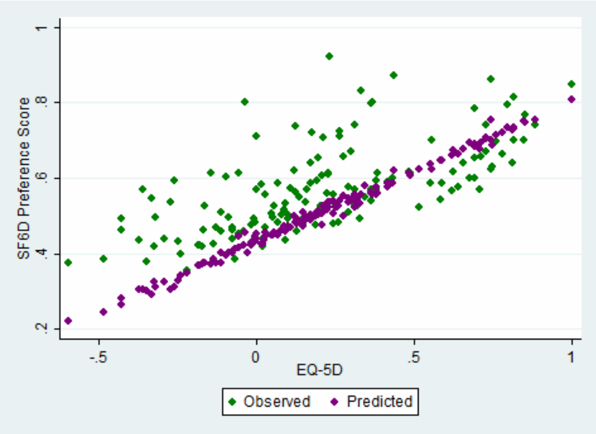
| ICD Group<br>0.69 <= EQ-5D < 0.79 | N | SF-6D | | PCS | | MCS | |
|---|---|---|---|---|---|---|---|
| | | Observed | Predicted | Observed | Predicted | Observed | Predicted |
| 1 | 22 | 0.62 | 0.65 | 36.65 | 40.16 | 48.87 | 47.25 |
| 2 | 28 | 0.63 | 0.63 | 37.98 | 38.25 | 46.87 | 46.37 |
| 3 | 75 | 0.71 | 0.74 | 43.98 | 46.29 | 50.37 | 49.81 |
| 4 | 63 | 0.64 | 0.66 | 43.23 | 44.03 | 48.03 | 46.63 |
| 5 | 22 | 0.63 | 0.65 | 36.54 | 40.81 | 47.93 | 47.54 |
| 6 | 20 | 0.62 | 0.68 | 37.33 | 43.78 | 50.78 | 49.22 |
| 7 | 25 | 0.68 | 0.68 | 43.53 | 43.77 | 48.99 | 47.61 |
| 8 | 43 | 0.64 | 0.67 | 36.78 | 40.28 | 48.92 | 48.16 |
| 9 | 24 | 0.67 | 0.70 | 40.48 | 45.07 | 51.07 | 48.53 |
| 10 | 176 | 0.70 | 0.72 | 44.19 | 46.37 | 49.77 | 48.78 |
| 11 | 27 | 0.69 | 0.69 | 39.33 | 43.17 | 50.49 | 48.14 |
| 12 | 72 | 0.68 | 0.71 | 40.91 | 44.40 | 50.73 | 49.15 |
| 13 | 24 | 0.66 | 0.70 | 41.91 | 45.10 | 47.53 | 46.66 |
| 14 | 46 | 0.69 | 0.71 | 42.12 | 44.96 | 50.17 | 48.29 |
| 15 | 35 | 0.68 | 0.70 | 39.95 | 42.95 | 49.93 | 49.05 |
| 16 | 14 | 0.65 | 0.69 | 39.71 | 44.93 | 50.97 | 46.94 |
| 17 | 12 | 0.65 | 0.67 | 45.48 | 46.64 | 44.32 | 45.23 |
| 18 | 25 | 0.63 | 0.66 | 33.22 | 37.27 | 51.95 | 50.37 |
| 19 | 32 | 0.66 | 0.70 | 41.97 | 45.27 | 47.69 | 47.18 |
| 20 | 94 | 0.70 | 0.72 | 44.89 | 45.74 | 50.18 | 49.70 |
| 21 | 31 | 0.68 | 0.69 | 42.61 | 42.78 | 50.41 | 49.25 |
| 22 | 34 | 0.69 | 0.73 | 43.12 | 45.70 | 49.56 | 48.84 |
| 23 | 64 | 0.72 | 0.74 | 44.27 | 45.81 | 50.62 | 49.46 |
| 24 | 37 | 0.67 | 0.71 | 43.67 | 45.64 | 48.27 | 48.12 |
| 25 | 40 | 0.66 | 0.71 | 41.97 | 44.77 | 48.59 | 48.02 |
| 26 | 35 | 0.69 | 0.74 | 46.6 | 47.51 | 48.48 | 48.79 |
| 27 | 458 | 0.67 | 0.68 | 39.22 | 41.61 | 51.02 | 48.77 |
| 28 | 63 | 0.66 | 0.67 | 40.98 | 42.13 | 46.87 | 46.86 |
| 29 | 167 | 0.70 | 0.72 | 43.76 | 46.20 | 49.74 | 48.57 |
| 30 | 10 | 0.61 | 0.71 | 45.19 | 46.57 | 42.12 | 47.37 |
| 31 | 28 | 0.65 | 0.69 | 37.75 | 43.43 | 50.01 | 47.53 |
| 32 | 27 | 0.67 | 0.70 | 41.25 | 45.44 | 49.51 | 47.52 |
| 33 | 47 | 0.69 | 0.74 | 46.02 | 47.48 | 47.26 | 48.10 |
| 34 | 60 | 0.70 | 0.69 | 38.75 | 40.67 | 50.35 | 47.91 |
| 35 | 38 | 0.68 | 0.69 | 40.57 | 41.27 | 49.78 | 49.18 |
| 36 | 568 | 0.69 | 0.70 | 40.71 | 42.14 | 52.73 | 51.25 |
| 37 | 330 | 0.66 | 0.68 | 39.74 | 41.37 | 51.86 | 50.73 |
| 38 | 146 | 0.70 | 0.72 | 42.86 | 45.29 | 51.76 | 50.14 |
| 39 | 32 | 0.68 | 0.70 | 45.21 | 43.80 | 48.21 | 48.82 |
| 40 | 130 | 0.68 | 0.71 | 43.23 | 45.45 | 49.25 | 48.45 |
| 41 | 25 | 0.71 | 0.75 | 44.10 | 47.04 | 49.28 | 49.39 |
| 42 | 264 | 0.67 | 0.71 | 44.50 | 46.89 | 48.19 | 47.77 |
| 43 | 23 | 0.64 | 0.69 | 43.12 | 46.06 | 45.79 | 46.28 |
| 44 | 76 | 0.67 | 0.70 | 42.18 | 43.95 | 49.52 | 48.55 |
| 45 | 69 | 0.69 | 0.71 | 44.21 | 45.03 | 49.11 | 48.32 |
| 46 | 323 | 0.67 | 0.70 | 41.70 | 44.37 | 49.13 | 47.87 |
| 47 | 133 | 0.66 | 0.68 | 41.99 | 45.43 | 48.60 | 45.57 |
| 48 | 217 | 0.68 | 0.70 | 40.66 | 42.99 | 50.73 | 49.29 |
| 49 | 102 | 0.69 | 0.71 | 40.08 | 44.08 | 51.67 | 48.74 |
| 50 | 24 | 0.68 | 0.73 | 46.87 | 48.06 | 46.64 | 47.02 |
| 51 | 1,105 | 0.68 | 0.71 | 43.80 | 45.65 | 48.33 | 48.23 |
| 52 | 225 | 0.70 | 0.72 | 44.80 | 46.70 | 49.30 | 48.44 |
| 53 | 389 | 0.66 | 0.68 | 41.17 | 43.86 | 50.55 | 48.78 |
| 54 | 108 | 0.71 | 0.73 | 44.42 | 45.96 | 50.72 | 49.24 |
| 55 | 56 | 0.70 | 0.72 | 42.05 | 44.37 | 51.53 | 50.06 |
| 56 | 90 | 0.68 | 0.72 | 46.47 | 48.50 | 46.10 | 46.30 |

| ICD Group<br>0.79 <= EQ-5D < 1 | N | SF-6D | | PCS | | MCS | |
|---|---|---|---|---|---|---|---|
| | | Observed | Predicted | Observed | Predicted | Observed | Predicted |
| 1 | 38 | 0.65 | 0.68 | 42.71 | 42.20 | 47.36 | 48.98 |
| 2 | 15 | 0.69 | 0.67 | 41.65 | 40.44 | 51.01 | 47.88 |
| 3 | 94 | 0.79 | 0.77 | 51.69 | 48.77 | 50.26 | 51.05 |
| 4 | 75 | 0.70 | 0.69 | 47.76 | 46.32 | 47.91 | 47.79 |
| 5 | 30 | 0.68 | 0.69 | 45.52 | 43.95 | 49.36 | 48.72 |
| 6 | 28 | 0.73 | 0.72 | 49.94 | 47.07 | 49.66 | 50.33 |
| 7 | 31 | 0.74 | 0.72 | 48.95 | 45.99 | 50.82 | 49.03 |
| 8 | 40 | 0.72 | 0.71 | 46.57 | 43.13 | 49.22 | 49.89 |
| 9 | 34 | 0.73 | 0.74 | 50.10 | 47.92 | 48.11 | 49.45 |
| 10 | 265 | 0.75 | 0.75 | 50.58 | 48.96 | 49.12 | 49.75 |
| 11 | 40 | 0.70 | 0.72 | 48.33 | 45.9 | 47.86 | 49.61 |
| 12 | 86 | 0.75 | 0.75 | 49.22 | 47.06 | 48.90 | 50.54 |
| 13 | 26 | 0.72 | 0.72 | 49.97 | 47.67 | 47.20 | 47.28 |
| 14 | 66 | 0.72 | 0.74 | 49.96 | 47.82 | 47.94 | 49.59 |
| 15 | 38 | 0.77 | 0.74 | 49.95 | 45.16 | 50.86 | 50.66 |
| 16 | 25 | 0.71 | 0.73 | 47.98 | 47.58 | 46.41 | 48.65 |
| 17 | 26 | 0.68 | 0.71 | 50.23 | 49.29 | 44.02 | 46.56 |
| 18 | 14 | 0.72 | 0.71 | 44.50 | 40.89 | 51.29 | 51.75 |
| 19 | 56 | 0.73 | 0.73 | 51.50 | 48.22 | 46.93 | 48.32 |
| 20 | 85 | 0.78 | 0.75 | 49.33 | 47.63 | 51.38 | 51.02 |
| 21 | 28 | 0.72 | 0.72 | 48.82 | 45.43 | 46.91 | 50.55 |
| 22 | 41 | 0.77 | 0.76 | 51.43 | 48.10 | 49.61 | 49.97 |
| 23 | 65 | 0.79 | 0.77 | 51.14 | 48.37 | 50.65 | 50.90 |
| 24 | 56 | 0.76 | 0.75 | 50.80 | 48.60 | 49.57 | 49.60 |
| 25 | 34 | 0.74 | 0.75 | 49.75 | 47.50 | 48.13 | 49.69 |
| 26 | 60 | 0.80 | 0.77 | 51.70 | 49.86 | 50.62 | 50.05 |
| 27 | 375 | 0.73 | 0.72 | 47.03 | 44.46 | 50.38 | 50.39 |
| 28 | 55 | 0.71 | 0.71 | 50.06 | 45.26 | 47.58 | 48.41 |
| 29 | 207 | 0.78 | 0.76 | 51.84 | 48.73 | 49.36 | 49.70 |
| 30 | 23 | 0.74 | 0.75 | 51.91 | 49.15 | 47.11 | 49.09 |
| 31 | 46 | 0.71 | 0.73 | 47.74 | 46.34 | 47.81 | 48.62 |
| 32 | 19 | 0.72 | 0.74 | 50.23 | 48.64 | 45.28 | 49.19 |
| 33 | 109 | 0.78 | 0.77 | 52.17 | 49.84 | 49.21 | 49.28 |
| 34 | 45 | 0.74 | 0.72 | 45.17 | 43.92 | 49.96 | 49.06 |
| 35 | 28 | 0.75 | 0.72 | 47.90 | 43.57 | 49.16 | 50.19 |
| 36 | 237 | 0.78 | 0.74 | 48.38 | 45.08 | 52.30 | 52.78 |
| 37 | 106 | 0.77 | 0.72 | 48.83 | 44.07 | 52.02 | 51.95 |
| 38 | 129 | 0.79 | 0.75 | 50.31 | 47.07 | 52.10 | 51.48 |
| 39 | 13 | 0.76 | 0.73 | 48.74 | 46.06 | 51.63 | 50.72 |
| 40 | 170 | 0.75 | 0.74 | 50.16 | 48.08 | 49.10 | 49.38 |
| 41 | 43 | 0.80 | 0.78 | 49.84 | 49.64 | 51.91 | 50.69 |
| 42 | 391 | 0.75 | 0.74 | 50.98 | 49.22 | 48.68 | 49.00 |
| 43 | 25 | 0.75 | 0.72 | 49.79 | 47.64 | 48.89 | 48.03 |
| 44 | 96 | 0.75 | 0.74 | 49.21 | 46.46 | 49.05 | 49.87 |
| 45 | 97 | 0.76 | 0.74 | 49.85 | 47.51 | 48.83 | 49.67 |
| 46 | 326 | 0.75 | 0.73 | 50.07 | 47.00 | 48.87 | 49.03 |
| 47 | 154 | 0.69 | 0.71 | 51.03 | 48.77 | 44.89 | 46.42 |
| 48 | 193 | 0.75 | 0.74 | 48.47 | 45.69 | 50.91 | 50.90 |
| 49 | 96 | 0.76 | 0.74 | 50.47 | 46.94 | 49.31 | 49.78 |
| 50 | 50 | 0.73 | 0.76 | 52.77 | 51.74 | 44.01 | 47.24 |
| 51 | 1,219 | 0.76 | 0.74 | 50.49 | 48.08 | 49.66 | 49.41 |
| 52 | 238 | 0.75 | 0.76 | 51.57 | 49.30 | 48.15 | 49.70 |
| 53 | 256 | 0.74 | 0.72 | 49.51 | 46.71 | 50.11 | 50.03 |
| 54 | 99 | 0.77 | 0.76 | 51.55 | 48.24 | 50.24 | 50.70 |
| 55 | 27 | 0.79 | 0.75 | 49.45 | 46.75 | 52.12 | 51.31 |
| 56 | 287 | 0.71 | 0.75 | 52.71 | 51.25 | 44.92 | 47.68 |

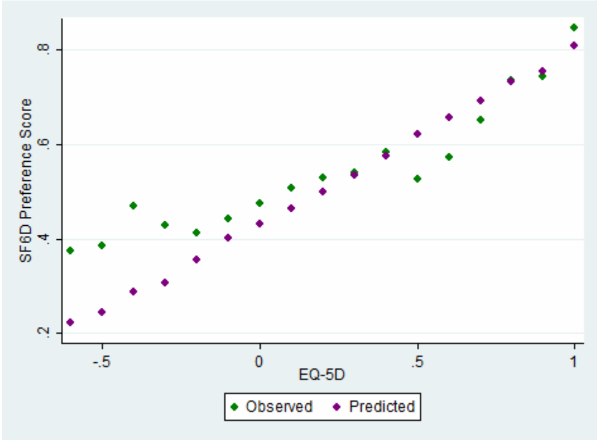
| ICD Group for EQ-5D values = 1 | N | SF-6D | | PCS | | MCS | |
|---|---|---|---|---|---|---|---|
| | | Observed | Predicted | Observed | Predicted | Observed | Predicted |
| 1 | 21 | 0.81 | 0.75 | 51.95 | 46.95 | 52.85 | 51.22 |
| 2 | 9 | 0.82 | 0.74 | 54.09 | 44.87 | 52.37 | 51.25 |
| 3 | 188 | 0.87 | 0.84 | 54.74 | 53.37 | 53.96 | 53.80 |
| 4 | 71 | 0.77 | 0.75 | 52.62 | 50.48 | 50.49 | 50.59 |
| 5 | 43 | 0.79 | 0.75 | 50.72 | 47.65 | 52.25 | 51.40 |
| 6 | 44 | 0.84 | 0.78 | 53.36 | 50.77 | 53.89 | 52.83 |
| 7 | 37 | 0.82 | 0.78 | 52.68 | 50.43 | 53.02 | 52.03 |
| 8 | 71 | 0.83 | 0.77 | 52.02 | 47.79 | 52.32 | 51.76 |
| 9 | 70 | 0.84 | 0.80 | 53.93 | 52.35 | 52.95 | 51.73 |
| 10 | 539 | 0.85 | 0.82 | 54.39 | 53.68 | 53.15 | 52.23 |
| 11 | 55 | 0.82 | 0.79 | 52.93 | 50.48 | 52.33 | 52.12 |
| 12 | 116 | 0.85 | 0.81 | 53.44 | 51.65 | 52.90 | 52.99 |
| 13 | 42 | 0.84 | 0.79 | 53.68 | 52.17 | 51.48 | 49.95 |
| 14 | 112 | 0.85 | 0.81 | 53.84 | 52.34 | 53.29 | 52.19 |
| 15 | 33 | 0.85 | 0.80 | 53.36 | 50.06 | 52.70 | 52.96 |
| 16 | 43 | 0.83 | 0.80 | 53.82 | 52.00 | 51.97 | 51.10 |
| 17 | 20 | 0.81 | 0.78 | 53.28 | 53.60 | 53.40 | 49.19 |
| 18 | 8 | 0.83 | 0.77 | 52.51 | 45.25 | 52.02 | 54.44 |
| 19 | 59 | 0.84 | 0.80 | 53.49 | 52.06 | 52.22 | 51.51 |
| 20 | 85 | 0.85 | 0.82 | 53.60 | 52.58 | 53.14 | 53.72 |
| 21 | 21 | 0.76 | 0.78 | 50.34 | 49.79 | 49.53 | 52.95 |
| 22 | 74 | 0.86 | 0.82 | 53.96 | 52.84 | 53.00 | 52.72 |
| 23 | 134 | 0.88 | 0.84 | 54.88 | 52.83 | 54.27 | 53.82 |
| 24 | 87 | 0.84 | 0.80 | 54.15 | 52.94 | 52.99 | 51.68 |
| 25 | 82 | 0.86 | 0.81 | 53.93 | 51.92 | 53.39 | 52.14 |
| 26 | 92 | 0.86 | 0.83 | 53.83 | 54.55 | 53.52 | 52.36 |
| 27 | 422 | 0.83 | 0.78 | 51.78 | 48.68 | 54.05 | 52.94 |
| 28 | 53 | 0.82 | 0.77 | 53.16 | 49.22 | 51.81 | 51.00 |
| 29 | 339 | 0.86 | 0.82 | 54.71 | 53.48 | 52.80 | 52.25 |
| 30 | 62 | 0.84 | 0.81 | 54.45 | 53.97 | 51.99 | 50.95 |
| 31 | 58 | 0.83 | 0.79 | 52.50 | 50.37 | 52.77 | 51.46 |
| 32 | 30 | 0.82 | 0.80 | 53.33 | 52.64 | 51.96 | 51.51 |
| 33 | 236 | 0.86 | 0.84 | 54.51 | 54.71 | 52.54 | 51.71 |
| 34 | 64 | 0.83 | 0.78 | 52.14 | 48.28 | 52.63 | 51.26 |
| 35 | 30 | 0.85 | 0.79 | 51.56 | 48.43 | 53.55 | 52.86 |
| 36 | 202 | 0.86 | 0.80 | 53.24 | 49.91 | 54.10 | 55.12 |
| 37 | 77 | 0.78 | 0.79 | 49.09 | 48.88 | 52.68 | 54.65 |
| 38 | 174 | 0.86 | 0.82 | 54.12 | 52.09 | 54.18 | 54.09 |
| 39 | 26 | 0.85 | 0.80 | 52.73 | 51.03 | 53.46 | 52.94 |
| 40 | 207 | 0.84 | 0.81 | 53.18 | 52.65 | 52.65 | 52.15 |
| 41 | 102 | 0.87 | 0.85 | 54.67 | 54.42 | 53.81 | 53.23 |
| 42 | 659 | 0.84 | 0.81 | 54.07 | 53.65 | 52.49 | 51.74 |
| 43 | 37 | 0.85 | 0.79 | 54.11 | 52.66 | 52.63 | 50.61 |
| 44 | 164 | 0.86 | 0.81 | 54.08 | 50.98 | 53.63 | 52.64 |
| 45 | 132 | 0.85 | 0.81 | 54.11 | 52.42 | 53.36 | 51.93 |
| 46 | 380 | 0.84 | 0.80 | 53.78 | 51.61 | 52.53 | 51.53 |
| 47 | 112 | 0.82 | 0.77 | 53.63 | 52.69 | 52.21 | 49.16 |
| 48 | 243 | 0.85 | 0.80 | 52.96 | 50.20 | 53.70 | 53.05 |
| 49 | 149 | 0.85 | 0.81 | 53.18 | 51.39 | 53.09 | 52.51 |
| 50 | 114 | 0.88 | 0.83 | 54.84 | 55.79 | 53.46 | 50.40 |
| 51 | 1,680 | 0.85 | 0.81 | 53.77 | 52.73 | 53.38 | 52.18 |
| 52 | 482 | 0.86 | 0.82 | 54.84 | 53.89 | 53.04 | 52.15 |
| 53 | 362 | 0.84 | 0.79 | 53.47 | 51.10 | 52.82 | 52.62 |
| 54 | 172 | 0.87 | 0.83 | 54.40 | 52.96 | 54.15 | 53.30 |
| 55 | 56 | 0.87 | 0.82 | 54.74 | 51.62 | 53.79 | 53.89 |
| 56 | 810 | 0.84 | 0.81 | 54.80 | 55.26 | 51.72 | 50.40 |

**Figure A3.1 Observed and predicted values against EQ-5D value**

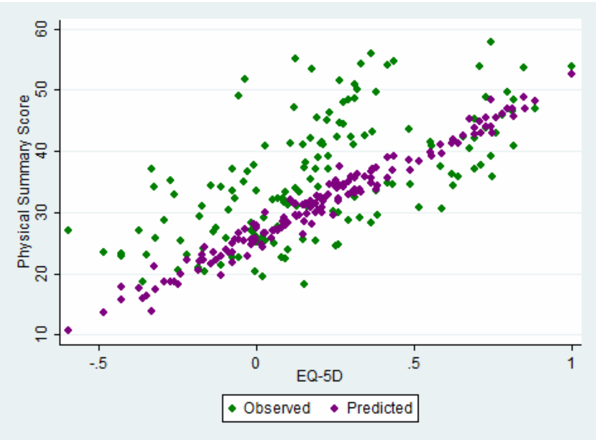
SF-6D; average observed vs expected by EQ-5D value



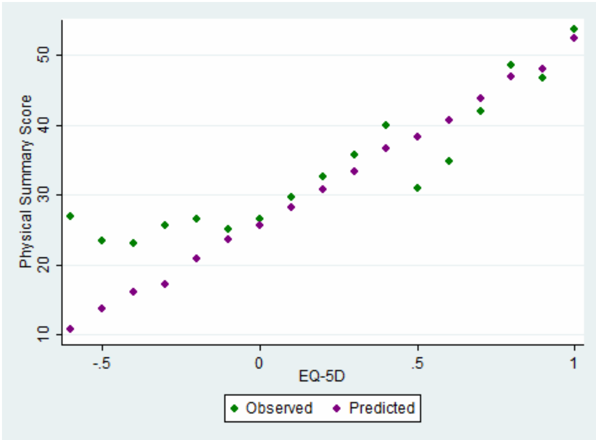

SF-6D; average observed vs expected by broad EQ-5D value



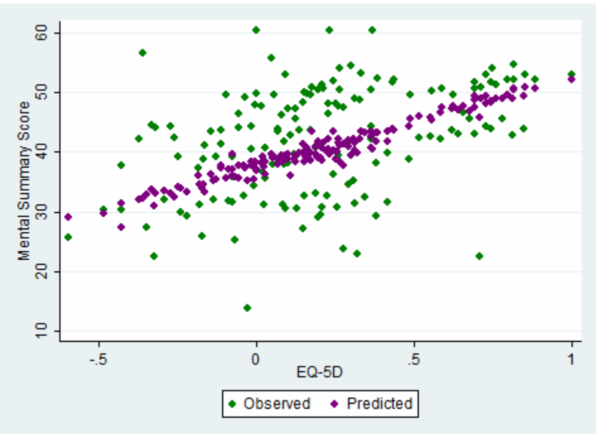

PCS; average observed vs expected by EQ-5D value




PCS; average observed vs expected by broad EQ-5D value




MCS; average observed vs expected by EQ-5D value




MCS; average observed vs expected by broad EQ-5D value

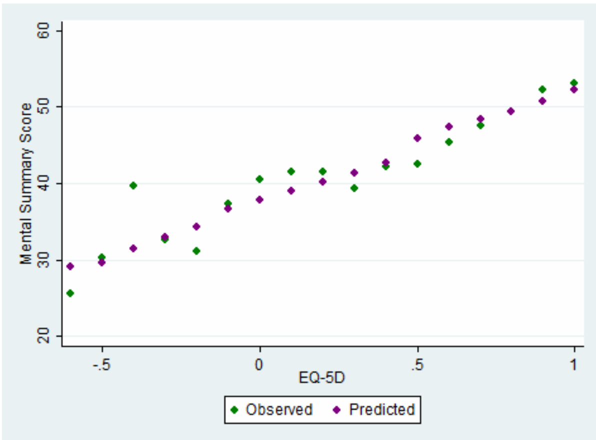


**Table A3.6: Observed and predicted probability of being Off work sick**

| SF-6D Groups | SF-6D Range | N | Observed | Predicted using SF-6D | Predicted using MCS & PCS |
|---|---|---|---|---|---|
| Group 1 | 0.345 to 0.45 | 90 | 0.2889 | 0.3674 | 0.1856 |
| Group 2 | 0.451 to 0.548 | 459 | 0.1874 | 0.1561 | 0.1148 |
| Group 3 | 0.551 to 0.65 | 2,067 | 0.0672 | 0.0580 | 0.0379 |
| Group 4 | 0.651 to 0.699 | 2,169 | 0.0175 | 0.0297 | 0.0199 |
| Group 5 | 0.701 to 0.749 | 2,626 | 0.0091 | 0.0156 | 0.0130 |
| Group 6 | 0.751 to 0.797 | 1,533 | 0.0157 | 0.0084 | 0.0114 |
| Group 7 | 0.800 to 0.846 | 1,864 | 0.0075 | 0.0057 | 0.0107 |
| Group 8 | 0.856 to 0.899 | 5,115 | 0.0039 | 0.0032 | 0.0094 |
| Group 9 | 0.922 to 0.922 | 7,580 | 0.0011 | 0.0017 | 0.0079 |
| Group 10 | 0.934 to 1 | 2,030 | 0.0025 | 0.0008 | 0.0066 |

**Table A3.7: Observed and predicted mean number of days off work by ICD categories**

| ICD categories | Observed | Tobit | Two-part model | Truncated negative binomial | Negative binomial |
|---|---|---|---|---|---|
| 1 | 26.9 | 27.5 | 26.5 | 26.6 | 17.4 |
| 2 | 28.8 | 28.9 | 28.8 | 28.5 | 16.2 |
| 3 | 10.4 | 12.8 | 9.6 | 9.7 | 2.7 |
| 4 | 24.8 | 25.8 | 24.5 | 24.4 | 17.0 |
| 5 | 25.2 | 26.1 | 24.9 | 24.8 | 17.5 |
| 6 | 24.8 | 25.6 | 24.4 | 24.5 | 17.7 |
| 7 | 21.7 | 22.6 | 21.2 | 21.4 | 7.5 |
| 8 | 23.3 | 24.4 | 22.9 | 22.8 | 12.1 |
| 9 | 17.1 | 19.2 | 16.6 | 16.2 | 9.4 |
| 10 | 16.8 | 18.2 | 16.2 | 16.3 | 6.3 |
| 11 | 18.2 | 19.6 | 17.5 | 18.0 | 7.8 |
| 12 | 12.6 | 14.3 | 11.8 | 12.1 | 4.3 |
| 13 | 16.6 | 18.3 | 15.7 | 15.5 | 8.6 |
| 14 | 12.3 | 13.4 | 11.6 | 11.7 | 3.4 |
| 15 | 12.7 | 14.8 | 11.9 | 12.1 | 4.7 |
| 16 | 18.0 | 19.5 | 17.2 | 17.5 | 9.9 |
| 17 | 20.2 | 22.0 | 19.7 | 19.7 | 8.1 |
| 18 | 19.8 | 20.7 | 19.1 | 19.4 | 8.2 |
| 19 | 15.2 | 16.6 | 14.4 | 14.8 | 6.4 |
| 20 | 15.8 | 17.3 | 15.0 | 15.3 | 6.8 |
| 21 | 23.6 | 25.0 | 23.2 | 23.2 | 12.6 |
| 22 | 13.9 | 16.1 | 13.1 | 13.7 | 3.2 |
| 23 | 12.3 | 13.7 | 11.2 | 11.6 | 3.0 |
| 24 | 20.1 | 20.9 | 19.4 | 19.5 | 7.7 |
| 25 | 16.8 | 17.8 | 15.9 | 15.9 | 6.8 |
| 26 | 14.5 | 16.7 | 13.6 | 13.7 | 6.0 |
| 27 | 23.9 | 25.3 | 23.5 | 23.4 | 10.7 |
| 28 | 25.2 | 26.2 | 24.9 | 24.8 | 15.3 |
| 29 | 14.0 | 15.6 | 13.1 | 13.4 | 4.8 |
| 30 | 6.1 | 9.9 | .* | 5.4 | 1.2 |
| 31 | 16.4 | 17.2 | 15.6 | 15.8 | 7.9 |
| 32 | 17.4 | 19.3 | 16.7 | 16.2 | 8.5 |
| 33 | 11.2 | 13.6 | 10.2 | 10.5 | 3.9 |
| 34 | 14.4 | 15.8 | 13.5 | 13.6 | 5.2 |
| 35 | 21.6 | 23.1 | 21.1 | 21.1 | 10.5 |
| 36 | 20.9 | 22.0 | 20.3 | 20.3 | 10.4 |
| 37 | 21.5 | 22.7 | 20.9 | 21.0 | 11.2 |
| 38 | 19.5 | 20.7 | 18.9 | 19.0 | 7.9 |
| 39 | 20.2 | 21.7 | 19.6 | 19.7 | 10.5 |
| 40 | 12.2 | 14.3 | 11.3 | 11.4 | 4.8 |
| 41 | 14.6 | 16.6 | 13.6 | 13.7 | 4.2 |
| 42 | 13.9 | 15.8 | 13.1 | 13.2 | 6.8 |
| 43 | 16.8 | 18.5 | 16.1 | 16.2 | 7.4 |
| 44 | 22.2 | 23.8 | 21.8 | 21.7 | 7.7 |
| 45 | 16.8 | 18.7 | 16.2 | 16.3 | 6.3 |
| 46 | 15.4 | 17.2 | 14.7 | 14.8 | 6.3 |
| 47 | 19.9 | 21.4 | 19.3 | 19.4 | 9.7 |
| 48 | 20.2 | 21.7 | 19.7 | 19.7 | 8.8 |
| 49 | 13.7 | 15.4 | 12.8 | 13.0 | 5.1 |
| 50 | 8.8 | 11.4 | 7.8 | 8.1 | 3.7 |
| 51 | 14.5 | 16.1 | 13.6 | 13.9 | 5.7 |
| 52 | 13.3 | 14.9 | 12.4 | 12.8 | 4.6 |
| 53 | 20.4 | 21.6 | 19.8 | 20.0 | 13.8 |
| 54 | 10.6 | 13.0 | 9.6 | 9.9 | 2.9 |
| 55 | 20.5 | 21.8 | 20.0 | 19.7 | 8.1 |
| 56 | 11.2 | 13.3 | 10.3 | 10.6 | 4.4 |
| Healthy | 19.8 | 21.1 | 19.2 | 19.3 | 8.1 |
| Total | 17.6 | 19.2 | 17.0 | 17.1 | 8.2 |

**Table A3.8: Truncated negative binomial model used to predict the number of days off work**

| Daysoff NO_zero | Coef. | Robust Std. Err. | z | P>z | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| group01 | 0.225 | 0.100 | 2.25 | 0.025 | 0.029 | 0.421 |
| group02 | 0.303 | 0.098 | 3.1 | 0.002 | 0.111 | 0.495 |
| group03 | -0.739 | 0.153 | -4.82 | 0.000 | -1.039 | -0.438 |
| group04 | 0.204 | 0.098 | 2.08 | 0.037 | 0.012 | 0.396 |
| group05 | 0.220 | 0.102 | 2.15 | 0.032 | 0.019 | 0.420 |
| group06 | 0.135 | 0.106 | 1.28 | 0.202 | -0.072 | 0.342 |
| group07 | 0.015 | 0.129 | 0.11 | 0.910 | -0.238 | 0.267 |
| group08 | 0.128 | 0.113 | 1.13 | 0.257 | -0.093 | 0.348 |
| group09 | -0.166 | 0.131 | -1.27 | 0.205 | -0.423 | 0.091 |
| group10 | -0.170 | 0.103 | -1.66 | 0.097 | -0.371 | 0.031 |
| group11 | -0.088 | 0.142 | -0.62 | 0.534 | -0.366 | 0.190 |
| group12 | -0.471 | 0.144 | -3.28 | 0.001 | -0.752 | -0.189 |
| group13 | -0.190 | 0.162 | -1.17 | 0.242 | -0.508 | 0.128 |
| group14 | -0.476 | 0.168 | -2.83 | 0.005 | -0.805 | -0.146 |
| group15 | -0.424 | 0.218 | -1.95 | 0.052 | -0.852 | 0.003 |
| group16 | -0.091 | 0.132 | -0.69 | 0.490 | -0.350 | 0.167 |
| group17 | 0.012 | 0.160 | 0.08 | 0.938 | -0.301 | 0.325 |
| group18 | 0.031 | 0.140 | 0.22 | 0.825 | -0.243 | 0.306 |
| group19 | -0.278 | 0.142 | -1.96 | 0.050 | -0.556 | 0.000 |
| group20 | -0.261 | 0.115 | -2.27 | 0.023 | -0.486 | -0.036 |
| group21 | 0.216 | 0.109 | 1.97 | 0.049 | 0.001 | 0.430 |
| group22 | -0.366 | 0.186 | -1.97 | 0.049 | -0.731 | -0.002 |
| group23 | -0.601 | 0.144 | -4.18 | 0.000 | -0.883 | -0.319 |
| group24 | -0.032 | 0.117 | -0.27 | 0.787 | -0.261 | 0.198 |
| group25 | -0.210 | 0.136 | -1.54 | 0.123 | -0.476 | 0.057 |
| group26 | -0.336 | 0.142 | -2.36 | 0.018 | -0.615 | -0.057 |
| group27 | 0.093 | 0.097 | 0.96 | 0.335 | -0.096 | 0.282 |
| group28 | 0.193 | 0.101 | 1.91 | 0.056 | -0.005 | 0.390 |
| group29 | -0.402 | 0.109 | -3.68 | 0.000 | -0.615 | -0.188 |
| group30 | -1.176 | 0.231 | -5.09 | 0.000 | -1.629 | -0.723 |
| group31 | -0.202 | 0.139 | -1.45 | 0.146 | -0.473 | 0.070 |
| group32 | -0.219 | 0.161 | -1.36 | 0.174 | -0.534 | 0.096 |
| group33 | -0.570 | 0.133 | -4.29 | 0.000 | -0.830 | -0.309 |
| group34 | -0.338 | 0.150 | -2.25 | 0.025 | -0.633 | -0.043 |
| group35 | 0.080 | 0.123 | 0.65 | 0.515 | -0.161 | 0.322 |
| group36 | 0.017 | 0.096 | 0.17 | 0.863 | -0.172 | 0.205 |
| group37 | 0.085 | 0.097 | 0.88 | 0.380 | -0.105 | 0.276 |
| group38 | -0.069 | 0.103 | -0.67 | 0.500 | -0.271 | 0.132 |
| group39 | 0.021 | 0.128 | 0.17 | 0.868 | -0.230 | 0.273 |
| group40 | -0.537 | 0.121 | -4.45 | 0.000 | -0.773 | -0.300 |
| group41 | -0.396 | 0.162 | -2.45 | 0.014 | -0.713 | -0.080 |
| group42 | -0.342 | 0.101 | -3.39 | 0.001 | -0.539 | -0.144 |

Table A3.8: Truncated negative binomial model contd

| Daysoff NO_zero | Coef. | Robust Std. Err. | z | P>z | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| group43 | -0.140 | 0.162 | -0.87 | 0.386 | -0.457 | 0.177 |
| group44 | 0.069 | 0.107 | 0.64 | 0.521 | -0.142 | 0.279 |
| group45 | -0.166 | 0.120 | -1.38 | 0.169 | -0.402 | 0.070 |
| group46 | -0.284 | 0.103 | -2.76 | 0.006 | -0.487 | -0.082 |
| group47 | 0.021 | 0.102 | 0.2 | 0.841 | -0.180 | 0.221 |
| group48 | -0.029 | 0.101 | -0.29 | 0.775 | -0.226 | 0.169 |
| group49 | -0.429 | 0.125 | -3.44 | 0.001 | -0.674 | -0.185 |
| group50 | -0.803 | 0.185 | -4.34 | 0.000 | -1.166 | -0.441 |
| group51 | -0.333 | 0.097 | -3.45 | 0.001 | -0.522 | -0.144 |
| group52 | -0.404 | 0.111 | -3.65 | 0.000 | -0.621 | -0.187 |
| group53 | 0.056 | 0.097 | 0.58 | 0.562 | -0.133 | 0.245 |
| group54 | -0.712 | 0.141 | -5.06 | 0.000 | -0.988 | -0.436 |
| group55 | 0.031 | 0.123 | 0.25 | 0.802 | -0.211 | 0.272 |
| group56 | -0.481 | 0.109 | -4.4 | 0.000 | -0.695 | -0.267 |
| Age/10 | 0.082 | 0.008 | 10.43 | 0.000 | 0.067 | 0.098 |
| female | -0.044 | 0.018 | -2.49 | 0.013 | -0.079 | -0.009 |
| Constant | 2.617 | 0.102 | 25.61 | 0.000 | 2.417 | 2.818 |
| | | | | | | |
| /lnalpha | -0.269 | 0.022 | | | -0.312 | -0.226 |
| alpha | 0.764 | 0.017 | | | 0.732 | 0.798 |
| Observations | 10964 | | | | | |

**Table A3.9: Comparison of productivity estimates**

All results are for 40-year old males. The values for this work are for ICD-10 group 1.

| EQ-5D Health state | Krol* | This work; SF-6D | This work; PCS & MCS |
|---|---|---|---|
| 2,3,1,3,3 | 11% | 50% | 45% |
| 3,3,1,2,1 | 17% | 77% | 61% |
| 2,3,1,2,1 | 56% | 80% | 72% |
| 2,1,3,1,1 | 51% | 77% | 72% |
| 2,2,1,1,1 | 81% | 86% | 83% |
| 1,1,1,1,1 | 89% | 89% | 89% |