Developing preference-based measures for diabetes: DHP-3D and DHP-5D

B Mulhern\textsuperscript{1,2}, A Labeit\textsuperscript{1}, D Rowen\textsuperscript{1}, E Knowles\textsuperscript{1}, K Meadows\textsuperscript{3}, J Elliot\textsuperscript{4}, J Brazier\textsuperscript{1}

1. School of Health and Related Research, University of Sheffield, UK
2. University of Technology Sydney, Centre for Health Economics, Research and Evaluation, Sydney, Australia, UK
3. DHP Research and Consultancy, UK
4. Academic Unit of Diabetes, Endocrinology and Metabolism, University of Sheffield, UK
Why develop condition specific preference-based measures?

- Cost effectiveness arguments are increasingly important in influencing reimbursement decisions
- Generic measures (like EQ-5D) may not be valid or responsive for measuring the day to day impact of diabetes and its treatment
Diabetes Health Profile (DHP)-18

- 18 item condition specific questionnaire
- Three domains:
  - Psychological distress (six items)
  - Barriers to activity (seven items)
  - Disinhibited eating (five items)
- Responses are on a four point likert scale e.g. never/sometimes/usually/always. Low scores indicate high quality of life rescaled onto a 0-100 scale
- The DHP in its current format cannot be used in economic evaluation using cost-per-QALY analysis as it does not incorporate preferences
Using the DHP-18 in economic evaluation

- The DHP in its current format cannot be used in economic evaluation using cost-per-QALY analysis as it does not incorporate preferences.
- To incorporate preferences, there needs to be:
  - Health state classification system
  - Preference weights for each health state
Developing a preference-based condition specific measure from an existing instrument

1. Extract a simplified health state classification from the instrument (often defines billions of possible ‘states’ or combinations) amenable to valuation

2. Value a sample of states defined by the new classification using a technique like TTO

3. Use multivariate statistical analysis to estimate an algorithm for scoring the new classification
Constructing the health state classification

Aim is to construct a health state classification with

• minimum loss of information
• responses to the original instrument must be able to be unambiguously mapped onto it
• text of the items should be altered as little as possible

• Dataset used is cross sectional data set from 237 people with diabetes recruited at a hospital in S. Yorkshire

• Methodology outlined here is described fully in Brazier et al, 2012; Young et al, 2009)
  • Dimensional structure
  • Item selection
Dimensional structure

- Used factor analysis to identify structurally independent dimensions

**Results:**

The items were grouped into the 3 identified factors:
1. Mood – 6 items from psychological distress items
2. Eating – 5 items from disinhibited eating plus one barrier to activity
3. Social limitations – 5 items from barriers to activity

Expert input (clinician and nurse) suggested two extra dimensions: ‘hypoglycemic attacks’ and ‘vitality’
Item selection

Informed by:

- **Psychometric analysis:** missing data, ceiling effects, floor effects
- **Rasch analysis:** item level ordering, differential item functioning, model fit, item range and spread across latent space
- All within the overall constraint of producing a classification that generates states amenable to valuation
Health state classification systems

DHP-3D

- **Mood:** You never/sometimes/often/very often find yourself losing your temper over small things
- **Social limitations:** Your days are never/sometimes/usually/never tied to meal times
- **Eating:** When you start eating you find it very easy/quite easy/not very easy/not at all easy to stop

DHP-5D

- **Hypoglycemic attacks:** You never/sometimes/usually/always worry about doing too much and going hypo
- **Vitality:** You are tired none/a little/some/most/all of the time
Valuation survey

- 300 interviews conducted with members of the UK general population: 150 for DHP-3D and 150 for DHP-5D
- There are 64 DHP-3D and 1280 DHP-5D health states in all – orthogonal array resulted in 65 states
- Each respondent valued 9 health states using time-trade off (TTO) (in accordance with the NICE reference case) using LT-TTO for states worse than dead
Modelling the TTO data

- Data was analysed using a variety of models: OLS, RE GLS, Mean model
- Standard model defined as:
  \[ y_{ij} = f(\beta x_{\lambda \delta}) + \epsilon_{ij} \]
- Dependent variable, \( y \), is TTO disvalue (1–TTO value) for health state \( i=1,2 \ldots n \) valued by respondent \( j=1,2\ldots m \)
- \( X \) is a vector of dummy explanatory variables for each level \( \lambda \) of dimension \( \delta \) of the health state classification
DHP-3D decrements – REGLS

- M2  0.026***
- M3  0.085***
- M4  0.127***
- E2  0.000
- E3  0.060***
- E4  0.074***
- SL2 0.022**
- SL3 0.044***
- SL4 0.065***

Significant coefficients = 8

$MAE = 0.117$

$MAE > 0.05 = 66.5\%$
DHP-5D decrements – RE GLS consistent model

- M2 0.015
- M3 0.027**
- M4 0.051***
- E2 0.026**
- E3 0.043***
- E4 0.043***
- SL2 0.012
- SL3 0.012
- SL4 0.029***
- H2 0.019*
- H3 0.035***
- H4 0.065***
- VT2 0.028***
- VT3 0.044***
- VT4 0.115***
- VT5 0.173***

Significant coefficients = 13

MAE = 0.119

MAE > 0.05 = 72.8%
Observed vs. predicted values

DHP-3D

DHP-5D
Examples

**DHP-3D state 333**
- You often find yourself losing your temper over small things
- Your days are usually tied to meal times
- When you start eating you find it not very easy to stop

Utility value = 0.811

**DHP-5D state 34315**
- You often find yourself losing your temper over small things
- Your days are always tied to meal times
- When you start eating you find it not very easy to stop
- You never worry about doing too much and going hypo
- You are tired most of the time

Utility value = 0.745
### HASMID classification system

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Wording</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td></td>
</tr>
<tr>
<td>Mood</td>
<td>Find yourself losing your temper over small things</td>
</tr>
<tr>
<td>Hypoglycaemic attacks</td>
<td>Worry about going hypo</td>
</tr>
<tr>
<td>Vitality</td>
<td>Tired</td>
</tr>
<tr>
<td>Social limitations</td>
<td>Days are tied to mealtimes</td>
</tr>
<tr>
<td>Self management</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>Feel you have control of your diabetes</td>
</tr>
<tr>
<td>Hassle</td>
<td>Find your life with diabetes is a hassle</td>
</tr>
<tr>
<td>Stress</td>
<td>Find your life with diabetes is stressful</td>
</tr>
<tr>
<td>Support</td>
<td>Feel supported with your diabetes</td>
</tr>
</tbody>
</table>

Enhances dimensions of DHP-5D
Discussion

- Demonstrated how PROMS can be converted into preference-based measures for calculating QALYs for use in economic evaluation
- Estimated relative importance of dimensions – e.g. vitality more important than worry about risk of hypos

But:
- These values come from general population – patients might give different values
- DHP-3D and DHP-5D only go down to 0.717 and 0.618 respectively compared to minus 0.569 for EQ-5D-3L
- DHP does not measure the consequences of complications arising from diabetes – but the day to impact of the condition
- DHP does not cover the full impact of diabetes self-management on people’s lives – see the new HASMID measure (DHP-5D plus)
- Are different condition specific preference-based measures comparable for informing resource allocation?
References


