This is a repository copy of Developing a dementia-specific preference-based quality of life measure (AD-5D) in Australia: a valuation study protocol.

White Rose Research Online URL for this paper:
http://eprints.whiterose.ac.uk/124629/

Version: Published Version

Article:

https://doi.org/10.1136/bmjopen-2017-018996

Reuse
This article is distributed under the terms of the Creative Commons Attribution-NonCommercial (CC BY-NC) licence. This licence allows you to remix, tweak, and build upon this work non-commercially, and any new works must also acknowledge the authors and be non-commercial. You don’t have to license any derivative works on the same terms. More information and the full terms of the licence here:
https://creativecommons.org/licenses/

Takedown
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.
ABSTRACT

Introduction Generic instruments for assessing health-related quality of life may lack the sensitivity to detect changes in health specific to certain conditions, such as dementia. The Quality of Life in Alzheimer’s Disease (QOL-AD) is a widely used and well-validated condition-specific instrument for assessing health-related quality of life for people living with dementia, but it does not enable the calculation of quality-adjusted life years, the basis of cost utility analysis. This study will generate a preference-based scoring algorithm for a health state classification system - the Alzheimer’s Disease Five Dimensions (AD-5D) derived from the QOL-AD.

Methods and analysis Discrete choice experiments with duration (DCE-D) and best–worst scaling health state valuation tasks will be administered to a representative sample of 2000 members of the Australian general population via an online survey and to 250 dementia dyads (250 people with dementia and their carers) via face-to-face interview. A multinomial (conditional) logistic framework will be used to analyse responses and produce the utility algorithm for the AD-5D.

Ethics and dissemination The algorithms developed will enable prospective and retrospective economic evaluation of any treatment or intervention targeting people with dementia where the QOL-AD has been administered and will be available online. Results will be disseminated through journals that publish health economics articles and through professional conferences. This study has ethical approval.

INTRODUCTION

Economic evaluation has become widely used as a method for assessing the value for money of health intervention programmes in Australia and overseas.1 The most prevalent form of economic evaluation is cost utility analysis, which compares interventions in terms of their incremental cost per quality-adjusted life year (QALY). The QALY is a single measure of outcome that takes into account both quantity of life (survival) and health-related quality of life (morbidity). The measurement of QALYs relies on a single preference-based index measure of health: a utility weight.

There are a large number of health-related quality of life instruments available to derive utility weights. The most frequently used are generic instruments suitable for any health condition; however an increasing number of condition-specific instruments are available. All preference-based measures have two common elements: a health state classification system that can be used to categorise all patients with the condition of interest and a means of obtaining a utility score for all states defined by the classification system.2

Previous studies assessing the health of people with dementia have used both generic (the 15-Dimensions;3–5 Assessment of Quality of Life,6–8 Quality of Well-being,9–11 Health Utilities Index,12–14 EuroQol-5-Dimensions (EQ-5D))15–17 and disease-specific (Dementia Quality of Life - Utility - (DEMQOL-U))2 18 19 preference-based instruments. Generic instruments are regularly recommended by health technology assessment organisations and regulatory authorities on the basis that they facilitate comparisons across different health conditions and diseases,20 thus addressing
the health system’s objective of allocative efficiency. However, generic instruments may lack the coverage to detect change in important aspects of certain conditions. For example, the five dimensions of EQ-5D lack attributes to capture cognition and relationships with family and social support that are important domains in measuring the quality of life of people with dementia. Those limitations have motivated the recent development of the DEMQOL-U, a preference-based instrument generated from the DEMQOL, a dementia-specific quality of life instrument. However, the DEMQOL-U’s use for people with dementia may be limited because it does not directly measure physical health dimensions and is time consuming to complete.

Our team has recently developed a new health state classification system, the alzheimer’s disease five dimensions (AD-5D) based on the QOL-AD nursing home version. The QOL-AD, originally developed for people with dementia living in the community, is the quality of life measure for people with dementia recommended in European guidelines due to its brevity, validity and wide usage. The AD-5D development process involved the use of statistical methods (psychometric, factor and Rasch analyses) to identify five key dimensions (‘memory’, ‘mood’, ‘physical health’, ‘living situation’ and ‘do things for fun’) and subsequently select items to represent the dimensions and generate the health state classification system. These five items appear in both QOL-AD nursing home and community versions.

The purpose of this study is to generate a preference-based scoring algorithm for the AD-5D, the health state classification system derived from the QOL-AD. This will be achieved by eliciting values for a selection of health states and conducting statistical modelling to develop an algorithm that derives utility values for all possible health states defined by the AD-5D descriptive system. This paper describes the process and methodology we will use to develop the utility values for the AD-5D (summarised in figure 1). When complete, this algorithm will enable data collected from any administration of the QOL-AD to be used in the economic evaluation of treatments and interventions for people diagnosed with dementia.

AIMS

This study has two main objectives:

- To value health states from the AD-5D descriptive system with a representative sample of the general population and a sample of dementia dyads (a person with dementia and a primary carer) in Australia using discrete choice experiment with duration (DCE) and best–worst scaling (BWS) elicitation techniques.
- To identify any potential differences in the utility values elicited from the general population and those from the dementia dyads and between the two elicitation methods of DCE and BWS.

METHODS AND ANALYSIS

Preference elicitation methods

The most commonly used preference elicitation methods for valuing health states include standard gamble (SG), time trade-off (TTO), and BWS (a particular form of DCE). Historically, researchers have favoured the SG and TTO to value health states.

Figure 1 Process and methodology of the AD-5D project. AD-5D, Alzheimer’s Disease Five Dimensions; BWS, best–worst scaling; QOL-AD, Quality of Life in Alzheimer’s disease.
They can also be administered in both
In this project, we will use a profile case
52
Comans TA,
derived values are not anchored on the 0–1 utility scale,
attributes between which individuals are asked to choose.
each containing a number of alternatives with different
a number of hypothetical health states (ie, choice sets),
admathe dimension and duration level main
effects between the attribute and duration to be deter-
mined. An example of a DCE_{TTO} choice task is shown in
table 1.
However, these methods have been criticised on the Grounds of task complexity, intensity of administra-
and potential contamination by risk attitudes and time preference. Consequently, methods such as DCE
and BWS have gained significant popularity in health economics research because they use an ordinal ranking
procedure, and therefore present a different cognitive challenge for respondents, avoiding the use of iterative
procedures. They can also be administered in both face-to-face and online settings, while online survey meth-
odology for SG and TTO arguably requires further development to guarantee reliable results.
In this project, we will use DCE with survival duration (DCE_{TTO}) and BWS to elicit preferences for health states described by the AD-5D. A DCE presents individuals with a number of hypothetical health states (ie, choice sets), each containing a number of alternatives with different attributes between which individuals are asked to choose. While this form of DCE can provide information on the relative preference of one health state over others, its derived values are not anchored on the 0–1 utility scale, thus cannot be used directly for QALY calculation. The DCE_{TTO} method was developed to directly anchor relative preferences to the utility scale through the inclusion of a survival/duration attribute, while fitting within the constraints of random utility theory. In our DCE_{TTO} choice sets presenting levels of the five dimensions of the AD-5D (memory, mood, physical health, living situation and do things for fun) and one survival duration attribute will be presented. Each dimension has four ordinal severity levels (‘excellent’, ‘good’, ‘fair’ and ‘poor’). A duration attribute with four levels (1, 4, 7 and 10 years) will be included to investigate individuals’ preferences with respect to survival durations.

BWS is a stated preference method that presents respondents with a series of hypothetical health states and asks them to identify each state’s best and worst attribute, hence offering the ability to compare attributes and associated levels within a single health state. Compared with a DCE_{TTO}, BWS is less cognitively complex and may therefore be more appropriate for vulnerable groups such as older people or people with limited cognitive function. In this project, we will use a profile case BWS, in each of the tasks, respondents will be asked to pick the best and worst attribute of a health state.

**Experimental design and construction of choice sets**

**Discrete choice experiment tasks**
The experimental design needs to determine both the total number of health states to be included in the valuation study and the combinations of health states to be valued by each respondent. The combination of attributes (five AD-5D dimensions and one duration) and levels (four levels for each attribute) results in the full factorial of 4096 possible health state profiles and over 16 million possible pairwise combinations (4096×4095). For practical purposes, a subset of these will be selected from a candidate set to reduce the number of health states used in the experiment while maximising the efficiency of the design.

A design maximised for the multinomial logit (MNL) model based on D-efficiency criteria will be used to generate 200 pairwise choice sets using the design software NGene. We will generate a design that can estimate the health state dimension and duration level main effects, as well as interactions between the health state dimensions and duration required to anchor DCE_{TTO} data on the full health—dead scale. Previous research suggests that participants can efficiently handle 10 choice sets at a time if they do not have any cognitive impairment, while five to six choice sets are optimal for people with mild cognitive impairment. Consequently, the full design will be divided into 20 blocks (versions) of the survey with 10 choice sets per block for the general population survey and 40 blocks with five choice sets per block for the dementia dyads interview. The blocking design will ensure balance among attribute levels. The construction of choice sets will also allow both the main effects (the effect of each attribute) and interaction effects between the attribute and duration to be determined. An example of a DCE_{TTO} choice task is shown in table 1.

<table>
<thead>
<tr>
<th>Health description A</th>
<th>Health description B</th>
</tr>
</thead>
<tbody>
<tr>
<td>You have poor physical health</td>
<td>You have excellent physical health</td>
</tr>
<tr>
<td>You have good mood</td>
<td>You have fair mood</td>
</tr>
<tr>
<td>You have fair memory</td>
<td>You have fair memory</td>
</tr>
<tr>
<td>You have good living situation</td>
<td>You have fair living situation</td>
</tr>
<tr>
<td>You have good ability to do things for fun</td>
<td>You have good ability to do things for fun</td>
</tr>
<tr>
<td>You live in this state for 4 years and then you die.</td>
<td>You live in this state for 7 years and then you die.</td>
</tr>
</tbody>
</table>

Which scenario do you think is better?

DCE, discrete choice experiment.

**Table 1** Presentation of a DCE task

---


**Open Access**
A web-based survey that contains three modules will be administered to a sample of the Australian general population in October to December 2017. In the first module, respondents will be given information and instructions on how to complete the DCE\textsubscript{TTO} task. At the end of the survey, respondents will be asked to rate their difficulty completing each task. The second and third modules consist of DCE\textsubscript{TTO} and BWS tasks. To reduce the cognitive burden for people with dementia, fewer choice sets (five DCE\textsubscript{TTO} choice sets and four BWS choice sets) will be administered during interviews.\textsuperscript{52} A standard script will be created as part of the interview protocol to explain the DCE\textsubscript{TTO} and BWS tasks to dementia dyads in plain language, with standard prompts if required.

**Table 2** Presentation of a BWS task

<table>
<thead>
<tr>
<th>Best Health description</th>
<th>Worst</th>
</tr>
</thead>
<tbody>
<tr>
<td>O You have good memory</td>
<td>O</td>
</tr>
<tr>
<td>O You have poor mood</td>
<td>O</td>
</tr>
<tr>
<td>O You have excellent physical health</td>
<td>O</td>
</tr>
<tr>
<td>O You have fair living situation</td>
<td>O</td>
</tr>
<tr>
<td>O You have fair ability to do things for fun</td>
<td>O</td>
</tr>
</tbody>
</table>

BWS, best–worst scaling.

general population survey and dementia dyad interviews. An example of a BWS choice task is shown in Table 2.

**Survey format**

Debate exists as to whose preferences are important when assessing healthcare.\textsuperscript{54} A prevailing view is that the general public funds services in a public health system and therefore their preferences should be taken into account when assessing programme for funding. On the contrary, other views are that only people who have experienced the condition could provide a reasonable perspective to inform preferences for that condition. Patient and public preferences can vary, with the public often framing aspects such as mobility and leisure constraints more negatively than people experiencing a condition where these aspects are impacted.\textsuperscript{55} In our project, the survey will be administered to both the general population and to dementia dyads so that either value is available to inform economic evaluations.

**General public**

A web-based survey that contains three modules will be administered to a sample of the Australian general population. In the first module, respondents will be given an introduction to the study and required to provide consent to continue the survey. Demographic data will be collected (eg, gender, age, education, marital status and employment) that can be used to determine the representativeness of the sample compared with the Australian population. In addition, respondents will be required to self-complete two quality of life questionnaires, the EQ-5D-5L and the QOL-AD (community living version) before commencing the main tasks.

The second and third modules will contain the DCE\textsubscript{TTO} tasks (10 choice sets) and the BWS tasks (four choice sets). The order of these modules will be randomly assigned to eliminate order effects bias in the responses: half of the general population sample will complete DCE\textsubscript{TTO} first, the other half BWS first. At the start of each module, respondents will be given information and instructions on how to complete the DCE\textsubscript{TTO} or BWS tasks and shown a sample task. To assess internal reliability and consistency of responses, 1 repeated choice set (from each of the DCE\textsubscript{TTO} or BWS blocks) and 1 dominant choice set will be included, creating 12 DCE and 6 BWS choice sets to be presented to each general population participant. At the end of the DCE\textsubscript{TTO} and BWS modules, respondents will be asked to rate their difficulty completing each task. At the end of the survey, respondents will be asked to compare the difficulty levels between DCE\textsubscript{TTO} and BWS tasks and provide information on their prior experience of dementia.

**Dementia dyads (one person with dementia and a primary carer)**

A survey with three modules will be administered to dementia dyads during a face-to-face interview. The first module will collect basic demographic data (eg, gender, age, education, marital status and employment), experience with dementia such as type of dementia, time since formal diagnosis and quality of life (using the EQ-5D-5L and the QOL-AD). The person with dementia will complete a General Practitioner-Cognition Test (GP-Cog) task as a quick reliable screen of cognitive function,\textsuperscript{56} while the carer will be asked questions about their care experience, time commitment and her/his own health. The second and third modules consist of DCE\textsubscript{TTO} and BWS tasks. To reduce the cognitive burden for people with dementia, fewer choice sets (five DCE\textsubscript{TTO} choice sets and four BWS choice sets) will be administered during interviews.\textsuperscript{52} A standard script will be created as part of the interview protocol to explain the DCE\textsubscript{TTO} and BWS tasks to dementia dyads in plain language, with standard prompts if required.

**Sample size and recruitment**

Two different samples are required to achieve the study objectives: the general population and the dementia dyad. The current theory of sampling determines that sample sizes are based on the characteristics of the study design, such as the number of attributes, the size of the population and the statistical power that is required of the model derived. Based on the suggestions in the literature and previous studies using DCE\textsubscript{TTO} and BWS methodology,\textsuperscript{46,57} we have set our recruitment target at 2000 members of the general population and 250 dementia dyads (250 people with dementia and 250 carers).

Quotas will be set for age, gender and geographic area during recruitment for the online survey to ensure the sample is representative of the Australian population. Survey respondents will be sourced from an existing Australian online panel, administered by PureProfile. This panel is drawn from volunteers (aged 18 and above and able to give consent) in the general population who are paid a small amount by the panel administrators for completion of the survey. The advantage of this approach is that a population can be drawn from the total available chosen based on prespecified criteria such as age and gender, thereby ensuring that a broadly representative population sample is obtained. Each respondent will use a web link to access the survey, so is able to self-complete at their convenience.

The recruitment process is guided by Australia’s National Health and Medical Research Council National Statement on Ethics Chapter 4.5.\textsuperscript{57} The statement articulates...
the right of people with a cognitive impairment to participate in research and outlines the considerations that need to be taken in this vulnerable population to ensure risks and burdens are justified. A sample of dementia dyads will be recruited from Queensland, New South Wales and South Australia from October 2017 to September 2018. A comprehensive recruitment approach will be undertaken by contacting eligible participants through aged care providers, residential aged care facilities and community centres in both metropolitan and regional areas. Purposeful sampling will be used with quotas set (e.g., residential and community dwelling; gender, age) to ensure the generalisability of the findings. Recruitment follows a two-step process. First, the primary caregiver is phoned by a member of the research team after registration. A brief screening using set questions written for the study is used to assess suitability for inclusion into the study. The process of participation is explained and the caregiver is asked whether this is something that the person with dementia (PWD) would be capable of and comfortable with. If during the telephone conversation it is clear that the PWD has severe dementia or is unable to respond to questions or is likely to be distressed by an interview from an unfamiliar person, the person is excluded from participation. If preliminary eligibility is determined, a face-to-face interview is booked and information about the study is posted to the participants.

Second, the research assistant checks on arrival for interview that the participant information sheet has been received and goes through this with the person and the carer, reminding them that participation is voluntary and they can withdraw or stop at any time. Consent to participate is then obtained (the PWD’s consent is witnessed by the primary caregiver). Interviewers will be people with experience in working with PWD and will have had additional training to be alert for signs of distress and modify or discontinue the interview as appropriate.

Pilot study

Pilot studies will be conducted with a subset of 200 (of 2000) from the general population sample and 25 (of 250) dementia dyads. The pilot aims to ascertain comprehension and understanding of the choice set tasks, attributes and their levels as well as the functioning of the survey instrument. The pilot will highlight any procedural issues for the experimental design of the survey and allow revisions if required. The average time taken during the online survey pilot will be used to set a minimum time for respondents to complete the main survey. Data from the pilot will be analysed to confirm the face validity of the survey instrument.

A think-aloud technique will be used in the pilot interviews with the dementia dyads to gauge participant understanding of the tasks and provide insight into the factors underlying the preferences of participants. By using the ‘think-aloud’ approach during the pilot, we are asking respondents to explain their thought process for making choices. If they repeatedly indicate they do not understand, or if the interviewer (who has experience working with PWD) deems they do not understand, transcripts and recordings of the interviews will be used by the research team, combined with GP-Cog scores, to review the recruitment and interviewing process for the remaining dyads.

Analytical plan

We will use an MNL (conditional) framework as outlined by McFadden46 to analyse both DCE-TTO and BWS responses. For both DCE-TTO and BWS, random effect utility functions will be estimated following the Random Utility Theory’s argument that the utility value that an individual attaches to an attribute in a choice scenario can be summarised by an explainable (fixed) component and an unexplainable (random) component.

The specific utility function for the DCE-TTO responses will be modelled using the approach developed and described by Bansback et al46 due to its additional time duration attribute. The BWS-based utility values will be estimated using a two-stage approach. In stage 1, the coefficients of a random effect utility function will be estimated, from which the BWS values will be generated. These values will be anchored onto the 1–0 full health dead scale (required to generate QALYs) in stage 2 by mapping the modelled values from a small selection of health states used for AD-5D (ranging from mild to severe impairment) generated from the DCE-TTO study to the ordinal best–worst estimates to translate the best–worst estimates. While this represents a new technique in this field, the process is equivalent to mapping from BWS to utility values using TTO47 or mapping from DCE to TTO.42

ETHICS AND DISSEMINATION

A steering committee consisting of researchers, consumers and aged care industry representatives will coordinate the project and oversee any concerns arising from the conduct of the research. This committee will meet monthly for the duration of the project.

This project will develop utility value sets for a new dementia-specific economic analysis tool, the AD-5D. This will be the first dementia-specific preference-based measure with an Australian value set. Once developed, the AD-5D utility algorithms can be used to generate utility weights from any completion of the QOL-AD instrument. The weights can be used to calculate QALYs for the economic evaluation of treatments and interventions targeting people with dementia. This algorithm is applicable not only to current and future clinical trials and intervention studies but also for previously collected data using the QOL-AD, from which the AD-5D was derived.

Dissemination will occur through academic publications and conference presentations. Algorithms developed in the project will be available online. As well, the authors will record an online video demonstrating the use of the algorithms.
open access

Author affiliations
1The Centre for Health Services Research, University of Queensland, Brisbane, Queensland, Australia
2NHMRC’s Partnership Centre on Dealing with Cognitive and Related Functional Decline in Older People, Sydney, New South Wales, Australia
3Menzies Health Institute Queensland, Griffith University, Brisbane, Queensland, Australia
4Centre for Health Economics Research and Evaluation, University of Technology Sydney, Sydney, New South Wales, Australia
5Helping Hand Aged Care, North Adelaide, South Australia, Australia
6Sydney Medical School, University of Sydney, Sydney, New South Wales, Australia
7Health Economics and Decision Science, School of Health and Related Research, University of Sheffield, Sheffield, UK
8Institute of Health and Biomedical Innovation, Queensland University of Technology, Brisbane, Queensland, Australia
9Institute for Choice, UniSA Business School, University of South Australia, Adelaide, South Australia, Australia

Acknowledgements
We would like to acknowledge the contributions to the design of this study from our consumer representatives from the NHMRC Cognitive and Related Function Decline Centre, TARA Quirk and Elaine Todd.

Contributors
TAC, K-HN, JR, BM, DR conceived the study; TAC, K-HN, AW and LL wrote the manuscript. All authors read, contributed and approved the manuscript.

Funding
This study is supported by funding provided by the National Health and Medical Research Council (NHMRC) Partnership Centre on Dealing with Cognitive and Related Functional Decline in Older People (grant number GNT1910000).

Disclaimer
The contents of the published materials are solely the responsibility of the Administrative Institution, Griffith University and the individual authors identified, and do not reflect the views of the NHMRC or any other funding bodies or the funding partners.

Competing interests
None declared.

Patient consent
Obtained.

Ethics approval
This study has ethical approval from Griffith University HREC (number 2016/626).

Provenance and peer review
Not commissioned; externally peer reviewed.

Open Access
This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and do not relect the views of the NHMRC or any other funding bodies or the funding partners.

REFERENCES

Developing a dementia-specific preference--based quality of life measure (AD-5D) in Australia: a valuation study protocol

Tracy A Comans, Kim-Huong Nguyen, Brendan Mulhern, Megan Corlis, Li Li, Alyssa Welch, Susan E Kurrie, Donna Rowen, Wendy Moyle, Sanjeewa Kularatna and Julie Ratcliffe

BMJ Open 2018 8:
doi: 10.1136/bmjopen-2017-018996

Updated information and services can be found at:
http://bmjopen.bmj.com/content/8/1/e018996

References

This article cites 51 articles, 0 of which you can access for free at:
http://bmjopen.bmj.com/content/8/1/e018996#ref-list-1

Open Access

This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/

Email alerting service

Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections

Articles on similar topics can be found in the following collections

Health economics (392)

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/