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ORIGINAL RESEARCH ARTICLE

Valuing the Quality-of-Life Aged Care Consumers (QOL-ACC) Instrument for Quality Assessment and Economic Evaluation

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Abstract

Objective This paper reports on the valuation of the classification system for the Quality-of-Life Aged Care Consumers (QOL-ACC) instrument using a discrete choice experiment (DCE) with duration with a large sample of older people receiving aged care services.

Methods A DCE with 160 choice sets of two quality-of-life state–survival duration combinations blocked into 20 survey versions, with eight choice sets in each version, was designed and administered through an on-line survey to older Australians receiving aged care services in home and via interviewer facilitation with older people in residential aged care settings. Model specifications investigating preferences with respect to survival duration and interactions between QOL-ACC dimension levels were estimated. Utility weights were developed, with estimated coefficients transformed to the 0 (being dead) to 1 (full health) scale to generate a value set suitable for application in quality assessment and for the calculation of quality-adjusted life-years for use in economic evaluation.

Results In total, 953 older people completed the choice experiment with valid responses. The estimation results from econometric model specifications indicated that utility increased with survival duration and decreased according to quality-of-life impairment levels. An Australian value set (range − 0.56 to 1.00) was generated for the calculation of utilities for all QOL-ACC states.

Conclusion The QOL-ACC is unique in its focus on measuring and valuing quality of life from the perspective of older people themselves, thereby ensuring that the preferences of aged care service users are the primary focus for quality assessment and economic evaluation.

1 Introduction

Aged care in Australia, as in many other countries, is a multi-billion-dollar industry. Over $21.5 billion was allocated in government expenditure to finance Australia's aged care system in 2019–2020. During this period over 1 million older Australians received care and support at home and over 230,000 were permanently living in residential care [1]. These estimates are expected to increase exponentially in the coming decades due to population ageing [2].

Whilst the aged care systems in many countries are financed, governed and managed as separate entities from health systems, in practice aged care and healthcare are inextricably linked. Older people accessing aged care typically have complex health issues and consequently are major healthcare service users [3]. A recent Royal Commission into Aged Care Quality and Safety in Australia highlighted inappropriate medication use and potentially preventable emergency department and hospital admissions for older people accessing aged care as major quality concerns adversely impacting the health system and causing unnecessary distress and suffering for older people and their families [4]. Such quality concerns are major issues for health and aged care systems in many other countries [5]. The COVID pandemic and its disproportionate adverse impacts for older residents has further heightened public consciousness and

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Key Points

The majority of preference-based instruments have tended to be applied in economic evaluations of interventions in healthcare settings, and their corresponding value sets have focused on adults of all ages rather than older people specifically.

We present the first value set for the Quality-of-Life Aged Care Consumers (QOL-ACC), a new preference-based instrument uniquely focused on the measurement and valuation of quality of life from the perspective of older people in receipt of aged care services.

Application of the QOL-ACC instrument and corresponding value set will ensure that the quality-of-life preferences of aged care service users are the primary focus for quality assessment and economic evaluation.

concerns relating to the neglect of, and under-investment in, aged care internationally [5–7].

Alongside increasing calls for more investment in aged care, there is an increasing awareness amongst policy makers and practitioners of the need for more person-centred quality assessment and economic evaluation evidence to help guide resource allocation decisions and promote system efficiencies [4]. Previous work by our team has highlighted that relatively few economic evaluations have been conducted in aged care system settings despite the large potential benefits associated with their application [8–12]. Commensurate with these findings, to date most existing preference-based instruments have tended to be applied in health system settings and have focused on adults of all ages rather than older people specifically [13–15]. However, prior work by our team and that of others has noted that older people's perceptions of salient quality of life dimensions encapsulating overall quality of life differ from younger populations, with a stronger focus on broader quality-of-life dimensions relative to dimensions more narrowly focused on health status [16–18]. Recognition of these key differences led to the development of the ICEpop CAPability instrument for Older people (ICE-CAP-O) [19]. The ICECAP-O has its theoretical origins in Sen's capability theory and was developed in 2008 as a preference-based instrument focused on capability with older people in the UK [19]. The underlying focus on capability differentiates the ICECAP family of instruments from most other preference-based quality-of-life instruments, which are anchored on the 0–1 (being dead to full health) scale required to generate quality-adjusted life-years (QALYs) [15]. The Adult Social Care Outcomes Toolkit (ASCOT) was developed in 2010 by researchers in the UK to evaluate the impact of social care on an individual's quality of life (referred to as Social Care Related Quality of Life) [20]. Whilst not developed specifically for application in aged care, both the ICECAP-O and the ASCOT have been applied with older populations in aged care settings to assess capability and social care-related quality of life, respectively [15, 18]. More recent international initiatives focused on incorporating a broader well-being framework into economic evaluation have led to the development of the Well-being of Older People (WOOP) instrument for measuring and valuing the well-being of older people in the Netherlands [21], and the EuroQol Health and Wellbeing measure (EQ-5D-HWB) for measuring and valuing health and well-being in adults of all ages [22].

The Quality of Life Aged Care Consumers (QOL-ACC) is a new instrument for the measurement and valuation of quality of life in aged care. The QOL-ACC was developed from its inception with older people accessing aged care services and supports in home and residential care settings to assess quality of life from their own perspective [23]. The research to develop the final descriptive system for the QOL-ACC has sought to be as inclusive as possible, with project representation from older people with mild to moderate cognitive impairment or dementia (where informed consent could be provided) as well as those with good cognition [24, 25]. With its aged-care specific focus, the QOL-ACC descriptive system uniquely incorporates salient quality-of-life dimensions that are most important to, and using language and content most meaningful and preferred by, older people receiving aged care services [24, 25].

This paper reports upon the final phase of the QOL-ACC project to value the QOL-ACC by applying discrete choice experiment with survival duration (DCE_{TTO}) methods [14, 26, 27] with a large sample of older Australians receiving aged care services. The valuation results from the DCE were utilised to derive a value set for all possible quality of life states defined by the QOL-ACC descriptive system for use in quality assessment and economic evaluation in aged care.

2 Methods

2.1 Discrete Choice Experiment with Duration

The use of Discrete Choice Experiments with survival duration (DCE_{TTO}) as an elicitation approach to generate value sets for accompanying preference-based measures is becoming increasingly common in health economics and health services research [14, 28]. Using this approach, the relative utility of different dimensions and levels defined within alternative health/quality-of-life states is derived from DCE tasks with an underlying framework based on Random Utility Theory developed by McFadden [29]. Random Utility

Theory assumes that, when presented with a discrete set of alternatives, individuals choose the option that generates the highest amount of utility from those on offer, with any deviations from this general decision rule explained by random factors [29]. The DCE_{TTO} method was developed to directly anchor relative preferences to the utility scale required for the calculation of QALYs by incorporation of a survival/duration attribute for each health/quality-of-life state being valued. This approach was initially developed and tested for the valuation of the EQ-5D-3L [26] and the EQ-5D-5L [27]. A recent review found that this approach has subsequently been successfully applied in more than 30 valuation studies globally [28].

2.2 The QOL-ACC Instrument

The descriptive system for the QOL-ACC, as previously highlighted, was originally developed from in-depth qualitative interviews about what quality of life means to older people receiving aged care services [24, 25]. The second phase of the project involved extensive psychometric testing (including face, content and construct validity testing) to test draft items and to finalise the content for the new descriptive system [25]. The QOL-ACC comprises six dimensions (independence, mobility, pain management, emotional well-being, social relationships and leisure activities/hobbies). Five response levels are attached to each dimension, ranging from the best level 'all of the time' to the worst level 'none of the time'.

2.3 Experimental Design

For this study, the DCE_{TTO} choice sets comprised a series of pairwise choices between QOL-ACC quality of life states described as alternative levels of the six dimensions of the QOL-ACC with differing survival durations (the survival duration attribute comprised four levels: 1, 4, 7 and 10 years). Survival duration levels were determined with reference to two main considerations, firstly, survival duration levels applied in other similar valuation studies applying the DCE_{TTO} method and resulting in meaningful and interpretable values [30–32], and secondly, the need to present a range of realistic survival duration levels for the population of interest, dependent older people with limited remaining life expectancy.

The full factorial generates 62,500 ($5^6 \times 4$) possible QOL-ACC quality-of-life states, which is not feasible for presentation in a series of choice sets. Hence, a D-efficient experimental design using a modified Fedorov algorithm was developed in NGene to generate 160 choice sets comprising pairwise comparisons of quality-of-life states [33]. The design was specified to facilitate the estimation of the quality-of-life state dimension and survival duration level main effects, in addition to the interactions between the quality-of-life state dimensions and survival duration required to anchor the DCE_{TTO} estimates on to the full health–dead scale [26, 27]. Quality-of-life state combinations of dimension levels that were considered highly implausible in practice were identified in advance by the research team in consultation with our Project Advisory Group and constraints were applied in the design to avoid these implausible combinations occurring [34, 35]. Implausible combinations included emotional well-being level 1 ("I am generally happy all of the time") with pain management level 5 ("When I experience pain, it is well managed none of the time") and emotional well-being level 1 ("I am generally happy all of the time") with social relationships level 5 (i.e., "I have good social relationships with family and friends none of the time").

Our previous research conducting DCEs with older people has indicated that a maximum of nine pairwise choice sets is optimal to reduce respondent fatigue and maximise completion rates [36, 37]. In addition, a degree of overlap in the attribute levels presented is preferred to reduce the complexity of the task and increase respondent efficiency [38, 39]. Hence, the design was specified to include a three-level overlap for the QOL-ACC dimensions and the full design of 160 choice sets was divided into 20 blocks (versions) of the survey with eight choice sets per block. DCE version allocation was randomised across study participants, specific to each setting (home or residential care). In addition, one common choice set was included in all survey versions to check respondent's understanding of the DCE choice task. This choice set was consistently presented as the ninth choice set in each block and comprised a clearly dominant option with the best quality-of-life state presented against the worst quality-of-life state (PITS state) with an equivalent survival duration.

2.4 Survey

The survey included three main sections. The first section comprised the QOL-ACC instrument. In addition to providing a measure of quality of life, completion of the QOL-ACC helped participating individuals to become familiar with the wording, formatting, and range of frequency levels for the six key dimensions of the QOL-ACC prior to undertaking the DCE task. The second section comprised the DCE choice sets. In addition to the level overlap previously specified, colour coding was also applied to the presentation of the DCE to reduce the complexity of the task, improve choice consistency and reduce the drop-out rate [39]. Colour coding was adopted for the presentation of dimension levels with the lightest colour for the highest level (All of the time) and the darkest colour for the lowest level (None of the time). For each choice set, the older person was asked to

make a choice between two hypothetical quality-of-life states including survival duration (described as Life A and Life B) indicating which they most preferred. An example choice set from the survey is presented in Appendix 1 in the Online Supplementary Material (OSM). The final section of the survey comprised a series of sociodemographic questions including age, gender, general health and general quality-of-life questions. For the survey participants receiving home-care services additional questions were asked relating to the level and types of care and support currently being received.

2.5 Study Sample

The research team consulted with the Project Advisory Group comprising key stakeholders from government, service providers and consumers (noting also that many older Australians contribute through co-payments or fees to access aged care services and supports in their own homes or in residential care) about the study design and the most appropriate study sample for the main value set to accompany the new instrument. The unanimous view was that in keeping with the underlying foundations and philosophy of the QOL-ACC project and with the development of the instrument itself, the main value set for our new instrument should be based on the preferences of aged care service users themselves as the primary population of interest for guiding quality assessment and resource allocation decision-making in the aged care sector.

Aged care service users include older people receiving aged care services at home (via Australian Commonwealth Home Support or Home Care Packages) and older people residing in residential care facilities. The survey was developed to accommodate two modes of administration: on-line administration with older people receiving aged care services at home and interviewer facilitation with older people in residential care. The interviews with older people in residential care were facilitated using paper-based booklets that replicated the design, format and presentation of the DCE choice sets in the on-line survey developed for older people receiving home-care services. Older people receiving aged care services at home were recruited through an on-line panel, nationally representative of older people in the community by gender and state or territory of residence. Older people in residential care were recruited through the project's partner aged care provider organisations operating across several Australian states (Australian Capital Territory, South Australia, Tasmania, Western Australia and Queensland). Permission was sought and ethical approval was granted to conduct the study from the Social and Behavioural Research Ethics Committee at Flinders University (Approval no: 5508). The survey was initially piloted with a small sample ($N = 10$) of older people in each care setting to assess understanding and comprehension prior to administering the main survey. A target sample size of $N = 1000$ (broadly consistent with the proportions of older Australians currently receiving aged care services and supports in home (80%) vs. residential care (20%) settings [1]) was considered sufficient to meet the requirements of the DCE_{TTO} experimental design. This target sample size ensuring precise estimation of model parameters for development of the preference-based scoring algorithm for the QOL-ACC whilst also protecting against any extremes of heterogeneity in preferences [40].

2.6 Data Analysis

Data were analysed and modelled using a similar approach to that adopted by the majority of recent valuation studies employing DCE_{TTO} methods. A conditional logit (clogit) model was used to estimate parameters interacting the QOL-ACC dimension levels with continuous survival duration [28]. Participants who failed the quality control rules (internal consistency test and/or survey completion of less than 5 min) were excluded from the data analysis. All estimations were performed in Stata version 15.01 (StataCorp LLC).

For each estimated model, there were 25 dimension-level coefficients: one for duration and 24 for duration interacting with each of the QOL-ACC dimensions (see Eq. 1 below where MO is mobility, PM is pain management, HA is emotional well-being, IND is independence, SR is social relationships and LA is hobbies/leisure activities, and U is the latent utility consisting of two main components: deterministic utility V and a stochastic/random error term ε; i represents individual and j choice sets). Coefficient values reflects the relative value decrement by deviating from the best quality-of-life state of with 'all of the time' across all dimensions. As such, it is expected that the coefficients would be negative and follow a logical ordering of absolute decrement values ('most of the time' < 'some of the time' < a little of the time < 'none of the time'). Statistical significance levels were assessed at 1% and 5%.

$$
\begin{aligned}
U_{ij} &= V_{ij} + \varepsilon_{ij} \\
V_{ij} &= \beta_0 T_{ij} + \beta_{12} M0_{\text{most}} T_{ij} + \beta_{13} MO_{\text{some}} T_{ij} + \beta_{14} M0_{\text{alittle}} T_{ij} + \beta_{15} M0_{\text{none}} T_{ij} \\
&\quad + \beta_{22} PM_{\text{most}} T_{ij} + \beta_{23} PM_{\text{some}} T_{ij} + \beta_{24} PM_{\text{alittle}} T_{ij} + \beta_{25} PM_{\text{none}} T_{ij} + \beta_{32} HA_{\text{most}} T_{ij} \\
&\quad + \beta_{33} HA_{\text{some}} T_{ij} + \beta_{34} HA_{\text{alittle}} T_{ij} + \beta_{35} HA_{\text{none}} T_{ij} + \beta_{42} IND_{\text{most}} T_{ij} + \beta_{43} IND_{\text{some}} T_{ij} \\
&\quad + \beta_{44} IND_{\text{alittle}} T_{ij} + \beta_{45} IND_{\text{none}} T_{ij} + \beta_{52} SR_{\text{most}} T_{ij} + \beta_{53} SR_{\text{some}} T_{ij} + \beta_{54} SR_{\text{alittle}} T_{ij} \\
&\quad + \beta_{55} SR_{\text{none}} T_{ij} + \beta_{62} LA_{\text{most}} T_{ij} + \beta_{63} LA_{\text{some}} T_{ij} + \beta_{64} LA_{\text{alittle}} T_{ij} + \beta_{65} LA_{\text{none}} T_{ij}.
\end{aligned} \tag{1}
$$

The subscripts on the beta coefficients correspond to a specific attribute dimension and a specific attribute level. The estimated coefficients from the clogit model reflect the relative importance of each of the QOL-ACC dimensions, however, their values are not anchored onto the utility scale. Following estimation, the coefficients were anchored on to the QALY 0–1 utility scale using the anchoring formulae developed for the DCE_{TTO} method [26].

3 Results

3.1 Socio-Demographic Characteristics

In total, 1,005 older people consented and fully completed the survey (home care $n = 806$ and residential care $n = 199$). Of these, a small proportion ($n = 49$; 0.05%) failed the internal consistency check for the DCE and in addition three older people completed the on-line survey in less than 5 min and were removed leaving a final sample of $N = 953$.

The socio-demographic characteristics of the study sample are presented in Table 1. There was a slightly higher representation of females (57%) and the majority (73%) of individuals indicated that they were born in Australia. As expected, reflective of higher-level care needs at the upper segment of the age pyramid in the oldest old (aged 80 years and above), older people participating from residential care settings were older on average (mean age 85 years) in comparison with those in home-care settings (mean age 75 years). The home-care sub-sample included representation from older people from all Australian states and territories. This was also the original intent for the residential care sub-sample. However, COVID restrictions operating at the time of data collection meant that it was not possible to collect data from older residents in two states (New South Wales and Victoria). A significant proportion (43%) of older people in the home-care sub-sample indicated that they were living alone at the time of survey completion. Approximately one-third of home-care participants indicated that they were receiving care and support through an aged care service provider but were unable to identify the level of home-care package level that they were receiving. These findings are consistent with previous phases of the development of the QOL-ACC, involving face-to-face interviews with older people at home, whereby similar proportions of older people recruited through our service provider partner organisations were unable to identify the current level of home-care package level that they were receiving [24]. Where identified by the older person, Table 1 indicates that more individuals were receiving a lower level of care package such as the Commonwealth Home Support Program or lower-level Home-Care Packages (HCPs) (level 1 and level 2) relative to the higher-level HCPs (level 3 and level 4). These findings are reflective of the current prevalence of home-care package level splits in Australia whereby greater proportions of older people are receiving lower levels of home-care support [41]. Overall, a higher proportion of older people reported their quality of life today as either 'excellent' or 'very good' (36%) relative to 'excellent' or 'very good' health today (22%).

3.2 DCE_{TTO} Model Results

The estimated coefficients and the corresponding anchored values for QOL-ACC dimension levels for application in the derivation of utilities are presented in Table 2. The results from the estimated model were largely reflective of the monotonic nature of the six dimensions of the QOL-ACC, with the majority of estimated coefficients following a logical order with the correct sign (negative sign, indicating consistent absolute decrements) and were statistically significant. The 'Estimated coefficients' column presents the standard model results without merging/collapsing any attribute levels and the 'Anchored values' column present final values calculated based on model results after merging attribute levels with non-monotonic decrements. The movement from being independent 'some of the time' to 'a little of the time' represented dimension levels that were non-monotonic and therefore these levels were collapsed for the purposes of generating anchored values. Impairments in 'mobility' and 'pain management' generated the highest utility decrements from level 1 to level 5, followed by reductions in levels of 'independence' and 'social relationships'. The ability to participate in 'hobbies/leisure activities' was associated with the smallest (relative) decrement

Table 1 Summary of socio-demographics characteristics

	Home care ($N=758$)	Residential care ($N=195$)	All ($N=953$)
	Mean (SD)	Mean (SD)	Mean (SD)
Age, y	74.5 (6.29)	85.17 (7.71)	76.69 (7.86)
	N (%)	*N* (%)	*N* (%)
Gender			
Female	432 (56.99)	114 (58.46)	546 (57.29)
Male	326 (43.01)	79 (40.51)	405 (42.49)
Born in Australia	559 (73.75)	132 (67.69)	691 (72.51)
State			
NSW	187 (24.67)		187 (19.62)
ACT	9 (1.19)	7 (3.59)	16 (1.68)
VIC	150 (19.79)		150 (15.74)
QLD	266 (35.09)	30 (15.38)	296 (31.06)
SA	89 (11.74)	92 (47.18)	181 (18.99)
WA	48 (6.33)	30 (15.38)	78 (8.18)
TAS	9 (1.19)	34 (17.44)	43 (4.51)
Highest level of education			
No qualifications	70 (9.23)	69 (35.38)	139 (14.59)
Completed high school	283 (37.34)	55 (28.21)	338 (35.47)
Undergrad. degree or professional qualification	254 (33.51)	33 (16.92)	287 (30.12)
Post-graduate qualification	98 (12.93)	6 (3.08)	104 (10.91)
Other	53 (6.99)	30 (15.38)	83 (8.71)
Living situation			
Living in residential care	–	195 (100)	195 (20.46)
Living alone	326 (43.01)	–	326 (34.21)
Living with other(s)—not relatives	20 (2.63)	–	18 (1.89)
Living with other relatives	35 (4.62)	–	35 (3.67)
Living with spouse/partner	377 (49.74)	–	377 (39.56)
Care package level (home care only)			
N/A (living in residential care)	–	195 (100)	195 (20.46)
Commonwealth Home Support Program	198 (26.12)	–	198 (20.78)
Home Care Level 1	129 (17.02)	–	129 (13.54)
Home Care Level 2	87 (11.48)	–	87 (9.13)
Home Care Level 3	57 (7.52)	–	57 (5.98)
Home Care Level 4	30 (3.96)	–	30 (3.15)
Unsure	257 (33.91)	–	257 (26.97)
Health today			
Poor	79 (10.42)	22 (11.28)	101 (10.60)
Fair	272 (35.88)	42 (21.54)	314 (32.95)
Good	259 (34.17)	63 (32.31)	322 (33.79)
Very good	134 (17.68)	47 (24.10)	181 (18.99)
Excellent	14 (1.85)	19 (9.74)	33 (3.46)
Quality of life today			
Poor	27 (3.56)	12 (6.15)	39 (4.09)
Fair	184 (24.27)	36 (18.46)	220 (23.08)
Good	276 (36.41)	70 (35.90)	346 (36.31)
Very good	225 (29.68)	50 (25.64)	275 (28.86)
Excellent	46 (6.07)	25 (12.82)	71 (7.45)

Table 2 Estimated coefficients and anchored values (conditional logit model, $N = 953$)

Variable	Estimated coefficients		Anchored values[a]	
	Coefficient	SE	Coefficient	SE
Survival duration (T)	**0.485**	0.024		
Mobility				
All of the time	0.000	–	0.000	–
Most of the time	**−0.039**	0.013	**−0.077**	0.024
Some of the time	**−0.039**	0.014	**−0.077**	0.024
A little of the time	**−0.067**	0.012	**−0.138**	0.024
None of the time	**−0.173**	0.013	**−0.357**	0.024
Pain management				
All of the time	0.000	–	0.000	–
Most of the time	−0.010	0.012	−0.022	0.025
Some of the time	**−0.037**	0.013	**−0.075**	0.025
A little of the time	**−0.091**	0.012	**−0.188**	0.023
None of the time	**−0.152**	0.012	**−0.315**	0.023
Emotional well-being				
All of the time	0.000	–	0.000	–
Most of the time	−0.005	0.013	−0.009	0.026
Some of the time	**−0.034**	0.012	**−0.071**	0.024
A little of the time	**−0.063**	0.013	**−0.130**	0.024
None of the time	**−0.119**	0.012	**−0.246**	0.023
Independence				
All of the time	0.000	–	0.000	–
Most of the time	−0.021	0.012	−0.042	0.023
Some of the time	**−0.063**	0.011	**−0.118**	0.018
A little of the time	**−0.052**	0.011	**−0.118**	0.018
None of the time	**−0.136**	0.011	**−0.281**	0.022
Social relationships				
All of the time	0.000	–	0.000	–
Most of the time	−0.007	0.012	−0.015	0.025
Some of the time	**−0.072**	0.012	**−0.149**	0.022
A little of the time	**−0.090**	0.011	**−0.185**	0.021
None of the time	**−0.134**	0.013	**−0.277**	0.026
Hobbies/leisure activities				
All of the time	0.000	–	0.000	–
Most of the time	**−0.025**	0.012	**−0.050**	0.024
Some of the time	**−0.035**	0.011	**−0.074**	0.022
A little of the time	**−0.051**	0.011	**−0.106**	0.022
None of the time	**−0.104**	0.010	**−0.216**	0.019
Estimation statistics				
Log likelihood	−4375.62			
Akaike information criterion (AIC)	8801.23			
Bayesian information criterion (BIC)	8992.04			

Bold typeface indicates significant at $p < 0.05$

SE standard error

[a]Anchor value = estimated coefficient (of each level-dimension)/duration coefficient

overall. The 'duration' coefficient was positive and statistically significant ($p < 1\%$), indicating a positive preference for a longer survival duration.

Sensitivity analyses included different econometric model specifications (scale multinomial logit (S-MNL) model) and modified sample selection criteria (excluding the home-care participants who were unsure about which home-care

package level they were receiving) were used for the purpose of comparison with the base-case results ($N = 953$). Overall, the estimated and adjusted coefficients were similar to the base-case results with respect to their logical orderings and relative importance. Detailed results of the sensitivity analyses are available upon request. Investigation of preferences across home-care and residential care sub-samples indicated some slight differences, with older residents generally placing higher importance on pain management relative to home-care participants and home-care participants placing higher importance on mobility. Results of the sub-group analysis are presented in Appendix 2 (OSM). From a policy perspective, the main objective was to generate an inclusive value set that aligns with the generic nature of the QOL-ACC in terms of its applicability across care settings. Hence, it was important to ensure representation from older people in both home and residential care in the final value set.

3.3 QOL-ACC Utility Weights

The relative utility weights of the six QOL-ACC dimensions originating from the conditional logit model (i.e., adjusted coefficients using the DCE_{TTO} anchoring formula previously discussed) are presented in Fig. 1. For all QOL-ACC dimensions, the lowest levels were associated with the highest utility decrements. The utility value distribution is presented in Fig. 2. The distribution was right skewed, with a mean of 0.72 (SD ± 0.24, range −0.56 to 1.00). Approximately 1.2% of all possible QOL-ACC quality-of-life state values had negative values, indicating that they were modelled to be worse than being dead.

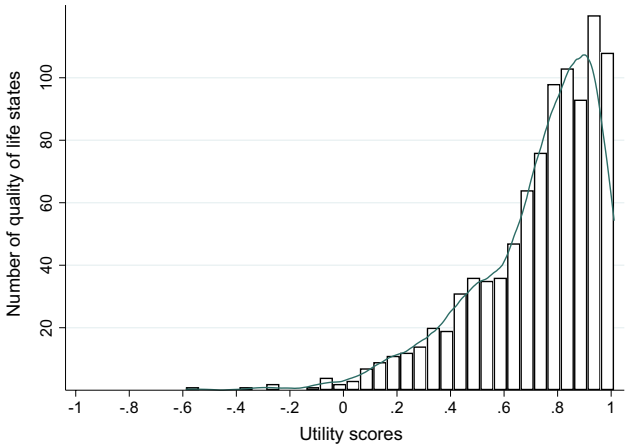

Fig. 2 Distribution of Quality-of-Life Aged Care Consumers (QOL-ACC) utility values ($N = 953$)

4 Discussion

This paper has reported upon the final phase of the QOL-ACC project to develop an older person-specific value set for the QOL-ACC to facilitate its application in quality assessment and economic evaluation. Application of the value set allows users to generate an overall utility value for individual responses. The collation of individual responses and corresponding utility values over time can be used to track preference-weighted changes in quality of life at an individual and aggregate level (important for quality assessment) and generate QALYs for application in economic evaluation, which is important to inform resource allocation decisions. The valuation exercise used a similar approach

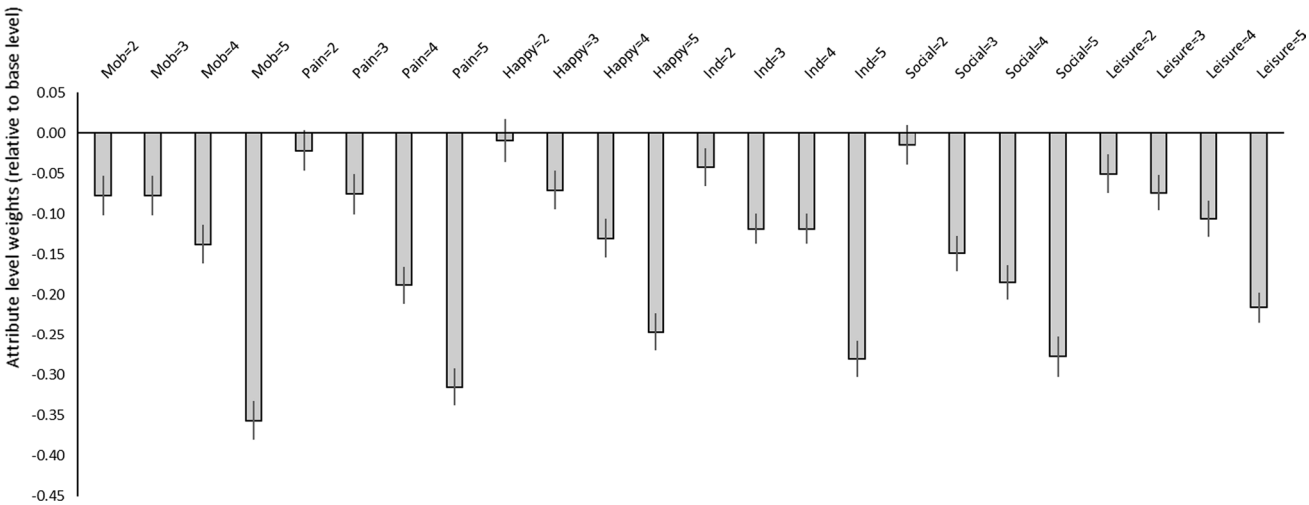

Fig. 1 Anchored coefficients of the conditional logit model ($N = 953$)

to that adopted by most recent valuation studies employing DCE_{TTO} methods [28] and followed recommended practice in experimental design, sampling and administration of the survey and the econometric analyses of the collected data as applied to health-state valuation [34]. The anchored coefficients presented in Fig. 1 demonstrate the large decrements in quality of life associated with the most severe impairment levels attached to all quality-of-life dimensions, with the largest decrement being associated with mobility. The finding that older people place a high value on their ability to remain physically mobile is reflected in other studies, including the WOOP instrument for measuring and valuing the well-being of older people in the Netherlands [21]. Our own prior research in the development of the descriptive system for the QOL-ACC also indicates that older people place a high value on this dimension as they recognise that declines in physical health and mobility impact upon their ability to perform everyday tasks and participate in activities that they had previously enjoyed [24]. The anchored values provided in Table 2 can now be used to generate utility values from datasets incorporating the QOL-ACC.

The QOL-ACC value set is unique in its focus having been derived from an older person aged care-specific sample. The QOL-ACC value set adopts the same underlying philosophy as that used to develop its descriptive system by directly incorporating the quality-of-life preferences of older Australians receiving aged-care services. In this way, QOL-ACC fills a current gap by providing a unique quality-of-life instrument that is specific for older people in aged care settings and is also consistent with the QALY model. The new value set for the QOL-ACC will ensure its applicability for economic evaluation across the aged care sector, which has broader and more inclusive goals than the health system, focused on the quality of life and well-being of older people as the ultimate outcome of interest [4, 23, 42]. Prior research conducted by our team laying the foundations for the development of the QOL-ACC strongly indicated that quality-of-life attributes that transcend health are highly valued by older people [23]. Many innovations in aged care seek to improve the quality of life of older people by focusing on the quality-of-life dimensions incorporated within the QOL-ACC. For example, consumer-directed care in the provision of aged care services in the home seeks to empower older people to live as independently as possible in their own community [43]. Similarly emerging models of reablement seek to maintain an older person's capacity to actively participate in home-life, community and society [42]. Whilst these models of care may not impact directly upon the health status of an older person, they may result in cost savings to government and society whilst delivering significant improvements in quality of life.[3] The QOL-ACC instrument is unique in providing a composite mechanism for incorporating quality-of-life benefits from the perspective of aged care users themselves into economic evaluation.

Whilst developed in aged care, the QOL-ACC has wider potential applicability to older people in a variety of care settings where the measurement and valuation of broader quality of life (as opposed to health status or health-related quality of life) for older people is pertinent, for example, rehabilitation services, transition care, hospital at home and integrated care. These are fast growing areas of health care where health and aged care systems intersect and the maximisation of older people's quality of life is a major focus [42].

This study has several limitations. The study sample is not completely representative of the population of older people receiving aged care services in the community in Australia. Latest estimates from the Australian Bureau of Statistics indicate that whilst most older Australians are regular internet users, a significant minority (38% in 2018) are not [44]. In contrast to the home-care sub-sample, the residential care sub-sample used an identical survey administered by a trained interviewer, thereby facilitating the inclusion of older people with little or no familiarity with the internet. Unfortunately, resource limitations prevented the administration of an equivalent mode of administration in home-care settings and therefore we are unable to completely exclude the possibility that our main findings may have been influenced by the mode of administration. However, it is important to note that the study sample was large, achieved broad representation from the population of interest (older people across all categories of aged care—from CHSP through to residential care) and broad coverage across Australian states and territories.

The QOL-ACC has demonstrated high content validity in the Australian context [24, 25]. Further work is planned to explore its potential for application in other countries. Our team is undertaking a follow-up study to the one reported here with a general population sample (working adults contribute approximately 75% of current funding for Australia's aged care system through income tax contributions), and the findings from this subsequent study will be utilised to make empirical comparisons in preference patterns between aged care service users and the general population, and to identify similarities or differences. Our team will also develop a general population-based value set that will be made available to interested parties upon request, noting that this algorithm will be recommended as a secondary rather than the main (primary) value set. Further valuation research is also recommended to understand whether preferences differ by country, as has commonly been found in other quality-of-life state valuation tasks [14], for the application of the QOL-ACC in other countries.

5 Conclusion

The QOL-ACC value set is now available for application in quality assessment and economic evaluation in aged care where the measurement and valuation of quality of life from the perspective of older people themselves is the primary focus. The DCE-based value set for the QOL-ACC will facilitate QALY calculations for the economic evaluation of new models of care, technologies and service innovations in aged care, with wide potential application for interventions delivered across health and aged care system settings. Further psychometric investigation will investigate the responsiveness of the QOL-ACC to changes in quality of life over time, generate minimal important difference statistics, and test the applicability of the QOL-ACC for other countries and care settings most relevant for older people.

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Conflict of interest/competing interests All authors declare no conflicts of interest.

Author contributions JR, EL and BM conceptualised this study. SB and JL led the valuation study design and analysis with contributions from CH, RM, JK, JR, EL and BM. JR wrote the first draft. All authors provided feedback on the first draft and agreed on the final draft. All authors reviewed and approved the final amendments. JR acts as guarantor.

Ethics approval This study was approved by the Social and Behavioural Research Ethics Committee at Flinders University (Approval no: 5508).

Consent to participate Informed consent was obtained from all individual participants included in the study.

Consent to publish Not available.

Availability of data and materials The dataset underpinning this research are available upon request from the study authors.

Code availability The software code and econometric model/s underpinning this research are available upon request from the study authors.

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