

# Preparatory study for the revaluation of the EQ-5D tariff: methodology report

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## Scientific summary

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# Scientific summary

## Background

Resources are limited and need to be allocated efficiently. The health-care sector is no exception. The National Institute for Health and Care Excellence (NICE) was set up to help make better health-care resource allocation decisions. NICE bases its recommendations on cost-effectiveness analyses with the quality-adjusted life-year (QALY) as the outcome measure. The EQ-5D is the preferred instrument to use when quantifying the health-related quality of life (HRQL) impact of medical interventions. Furthermore, the UK EQ-5D preference-based 'tariff', or population value set, is used not just by NICE, but by other agencies both in the UK and elsewhere, as a basis for economic evaluation, and in a wide range of other applications, including population health surveys (e.g. the Health Survey for England), burden of disease studies, hospital inpatient surveys, and, more recently, the NHS Patient Reported Outcome Measures initiative.

The current EQ-5D tariff is based on the Measurement and Valuation of Health (MVH) study, from 1994. It used face-to-face interviews of a representative sample of the general public. A selection of hypothetical EQ-5D states were assessed using the time trade-off (TTO) method. The results were modelled in terms of the EQ-5D descriptive system to provide a population value set, which, in effect, is a preference-based tariff of HRQL weights for all 243 EQ-5D states.

In the past 15 years, developments have led to the need for a revaluation of the EQ-5D. These include increasing recognition of the shortcomings of the MVH TTO design, in particular in the context of observations worse than dead; the new advances in methods for valuing health states other than TTO, such as discrete choice experiments (DCEs); new advances in the mode of valuation, other than face-to-face interviews; and the development of a revised version of the EQ-5D, with five levels (EQ-5D-5L) rather than three.

In order for NICE to make the most appropriate decisions, the EQ-5D population value set needs to be one that is up to date, based on the latest understanding of health-state preferences. The 'Preparatory study for the Re-valuation of the EQ-5D Tariff project' (PRET) is a methodological study funded by the Medical Research Council (MRC)-National Institute for Health Research (NIHR) Methodology Research Programme, and aimed to contribute to the generation of EQ-5D-5L population value sets by exploring a range of methodological issues associated with a number of health-state valuation techniques. 'PRET – Additional Sample' (PRET-AS) is a formal Medical Research Council-approved extension to PRET, funded by the EuroQol Group (the developers of EQ-5D), to allow further investigations into health-state valuation-related topics.

## Methods

The project had four stages. Stage 1 examined eight key issues relevant to health-state valuations:

1. How the duration of the health state being valued affects preferences for the state.
2. How the perspective of the valuation exercise (i.e. whose health it is) affects health-state preferences.
3. How length of 'lead time' used in the lead time variant of time trade-off (LT-TTO; a new mechanism to value states worse than being dead on the same scale as states better than being dead) affects health-state preferences.
4. How the timing of health states (i.e. when health states take place) affects preferences.
5. How the satisfaction associated with the health state affects preferences.

6. How lead time of different durations is 'exhausted' when valuing the worst possible EQ-5D-5L health state.
7. Whether EQ-5D-5L states can be valued using DCEs with duration as an attribute (DCE<sub>TTO</sub>).
8. The feasibility of binary choice administration of LT-TTO in an online environment.

These were examined through a series of binary choice exercises. The most basic question format (type I) took the following form:

**[Scenario A]:** you will live in health state **H** for 10 years and die.

**[Scenario B]:** you will live in full health for (**V** × 10) years and die (where **V** is a value between 0 and 1).  
*Which of the two scenarios do you think is better?*

The assumption is that if, for example, the duration of the health state affects the HRQL value of the health state then this will be captured by a variation in the binary choice answers depending on the duration of the state, whereas other factors are fixed. PRET and PRET-AS used seven further variations of the question, by including information on lead time, perspective, satisfaction with the health state, and so on. Each of the eight topics above was explored by examining data on one or more type of question.

Stage 1 of PRET conducted an online survey with 3000 respondents, addressing topics (1) to (7) above. PRET-AS collected data from a further 3000 respondents online, focusing on topics (7) and (8). Question types I–V in stage 1 used the same five health states based on EQ-5D-5L states but included only one attribute. The descriptions were partial in that the unaffected dimensions were not mentioned, and some dimensions were not presented in full (e.g. 'extreme pain' rather than 'extreme pain or discomfort'). The reason for the use of such states for these question types, as opposed to whole EQ-5D states, was (a) to make the task as simple as possible and (b) to examine interactions between the topic and the dimension of health. On the other hand, type VI questions exploring the exhaustion of lead time used the worst possible EQ-5D-5L state (55555), and type VII DCE<sub>TTO</sub> questions used a selection of whole EQ-5D-5L states.

Stage 2 compared the results of a section of the stage 1 online survey to those of an identical survey conducted in 200 face-to-face computer-assisted personal interviews (CAPIs), covering topics (1) to (7).

Stages 3 and 4 examined in more detail and depth select issues taken from stage 1. Stage 3 consisted of CAPI surveys of a representative sample of 300 using examples of binary choice TTO, LT-TTO, and DCE<sub>TTO</sub>, each followed by extensive feedback questions. Stage 4 was a more intensive exercise involving a qualitative analysis of people's thought processes during both binary choice (DCE and DCE<sub>TTO</sub>) and iterative (TTO and LT-TTO) health-state valuation exercises. Data were collected through 'think-aloud' methods using a convenience sample of 30. Stages 3 and 4 used a selection of whole EQ-5D-5L health states.

## Results

### Respondents

The two online surveys in stage 1 had 3159 and 2999 respondents, respectively, recruited from the same commercial internet panel. The stage 2 and stage 3 CAPI samples consisted of 201 and 300 respondents, respectively, recruited by knocking on 1 in 10 doors of selected postcodes in five areas of the UK. The samples in stages 1–3 were representative of the UK population under 65 years of age in terms of age and gender. The stage 4 think-aloud interviews had a convenience sample of 30, recruited at the University of Sheffield from non-academic staff. This sample was younger, better educated, and had more females compared with the general population.

### Stage 1: PRET

Of the topics examined, regarding topic (1), although the *duration* of the health state affected the preference for the state, there was no clear pattern regarding the direction or the magnitude. In other

words, there is no single answer to *whether* constant proportional TTO (CP-TTO) is violated: future research should focus on *when* it is violated. Regarding topic (2), the *perspective* of the exercise did not result in significant changes to health-state preferences across pooled data, although different patterns were observed across the severe states. Regarding topic (3), adding *lead time* had an impact on preferences, although there was no clear pattern to the results. In general, the longer the lead time to duration, the lower was the frequency of respondents exhausting lead time. Question type IV with lead time was used to examine topic (4) on *time preference*. The data allow the derivation of the minimum level of time preference that is consistent with a particular choice to be made, given the combinations of the relevant parameters. The implied minimum time preference rates were positive in most cases. In general, the rate was found to fluctuate by state and by duration. Some scenarios, in particular the ones with short durations, resulted in very high time preference rates (e.g. 500%). The implied time preferences were not affected by the different perspectives. Regarding topic (5), the reference to the level of *satisfaction* in the health state in question had a significant impact on the preference for the state: higher satisfaction was associated with positive preference. Regarding topic (6), *exhaustion of lead time* was affected by the length of the lead time relative to the duration of the health state in question. At the same time, exhaustion of lead time in online LT-TTO appeared to be much higher than that observed in face-to-face iterative LT-TTO.

### Stage 1: PRET-AS

The PRET-AS online survey indicated that, regarding topic (7),  $DCE_{TTO}$  is a valid method for generating health-state utility values for EQ-5D-5L, and resulted in coefficients that are logically ordered within each dimension; it produced a unimodal set of predicted values, ranging from  $-0.845$  to  $1.0$ , without relying on arbitrary transformation of negative values, or exogenous anchoring of the value of being dead. Regarding topic (8), binary choice LT-TTO may be feasible to produce utility values, but further work is required to develop the optimal selection of the states to be used in the valuation and for the modelling of results to generate predicted health-state values.

### Stage 2

The online and CAPI methods were found to produce comparable results for the seven binary choice tasks used in PRET, covering topics (1) to (7). Although the two samples had some statistically significantly different demographic make-up, controlling for these did not affect the overall outcome. One of the main differences between the two samples was in respondents' self-reported health: the online sample appeared to be significantly less healthy than the CAPI sample.

### Stage 3

The three methods used (TTO, LT-TTO,  $DCE_{TTO}$ ) were acceptable to respondents. TTO and LT-TTO may be easier to complete than  $DCE_{TTO}$ . When respondents ranked the order of importance of the EQ-5D-5L dimensions, there was some evidence of an effect of the order in which the dimensions are presented. Some respondents were uncertain about the relative ordering of level 4, 'severe', and level 5, 'extreme', problems. A number of personal and/or subjective factors and background characteristics had an impact on responses to the tasks.

### Stage 4

In addition to  $DCE_{TTO}$ , a DCE with no duration was added, and TTO and LT-TTO were used in the full iterative administration. The think-aloud method and the follow-up questions revealed that respondents used a range of strategies to complete the various tasks. In line with stage 3, uncertainty regarding level 4, 'severe', and level 5, 'extreme', problems was observed. Furthermore, respondents incorporated a range of personal factors that were linked to their own life and health experiences.

## Conclusions

Together, PRET and PRET-AS have conducted a series of empirical work surveying over 6500 respondents, across four stages. The overall project has examined a number of key topics associated with the valuation of hypothetical health states, in particular the EQ-5D-5L. The first stage had a very wide coverage, across eight topics, and these were explored using binary choice questions in large-scale online surveys. The second stage compared a version of the online survey with a CAPI using identical questions. The third and fourth stages focused on more specific issues and explored them in increasing detail, using CAPIs and qualitative analysis.

One theme that emerged from stage 1 was the relevance of health states themselves. The effects of duration, perspective, timing, and satisfaction were all somewhat different across different health states. Time preference also depended on duration. The other findings indicate that  $DCE_{TTO}$  is a promising approach, and that binary choice tasks are robust to an online administration. Binary choice LT-TTO has scope to be adapted for an online delivery, but the risk of increased exhaustion of lead time needs to be examined further.

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