# Societal perspective on the eliciting of health states preferences

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## Abstract

With the concept of "societal perspective" in mind, a study using the PTO and 8 EQ-5D defined health states, (using two selection criteria: states self assessed by people in a real context -women with breast cancer-, and similar distance in the TTO-York tariff), with a sample of 51 individuals selected from the general population of Navarra (Spain), was carried out.

The main objectives were: 1) To elicit some EQ-5D health states values using a societal technique (PTO); 2) to check people concern about severity of illness when valuing equal gains from different starting points in the scale; and 3) to asses the effect on values of limited potential health improvements.

The results shown very high values for the health states selected (0.90 to 0.99), due to the effect of anchoring on immediate death. Severity does not seem to be considered by the majority of people interviewed, although some 25% of them showed preference for similar health gains in those individuals in worse initial health. The same can be said for the concern for the limited potential health improvement, where most people seem to show an utilitarian perception.

Keywords: EQ-5D, PTO, Severity of illness, potential health improvements.

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## Introduction

The valuation of health states aims at obtaining a health *numéraire* which proves useful for the economic evaluation of alternative courses of action in health, or alternative health technologies. Through such valuation the utility of health in both qualitative and quantitative terms is obtained. The general model used is commonly called *the QALY (Quality Adjusted Life Years) model*, in which quality and quantity of life are multiplied in a unique index. In this model, the unit of health is the healthy year. Health gains are independent of who enjoys them, of his/her age, of his/her previous health status, or of his/her potential health improvement. Many economic evaluations of health technologies propose using the QALY as unit of effectiveness in order to establish priorities between courses of action that compete for budget assignments.

Different techniques may be used to obtain health state utilities. These techniques used to value health care benefits include VAS (visual Analogue Scale), ME (Magnitude Estimation), SG (Standard Gamble), TTO (Time Trade-off), PTO (Person Trade-off) and WTP (Willingness to pay) (for a review see Brazier et al. 1999). In general, these techniques measure the utility of individual states of health, which are then aggregated to obtain the gains in utility derived from changes in health. These techniques, however, as they are currently used, fail to capture the preferences of individuals with respect to health gains that affect other individuals. (Nord, E. et al. 1999)

The *Person Trade-Off (PTO)* technique intends to capture the preferences of individuals relative to collective choices that do not directly affect the health status of the individual whose preferences are being elicited. Essentially, this technique sets the individual in the position of a social decision-maker with a limited budget who has to choose among a series of alternative health technologies. The individual's valuations of health states are obtained through a procedure which tries to assess when the individual, as a social decision-maker, is indifferent between the number of people that may benefit from the different health technologies that compete for a given budget. The budget restriction implies that some people that could benefit from treatment are going to be denied such treatment (Nord, E. 1995).

The procedure of the PTO technique consists of presenting the individual as a decision maker with two variables: the number of people that may benefit from a health program and the health improvement to be brought about by the implementation of that health program. The individual must then choose between the combination of these two variables that he considers equivalent.

The PTO technique was used for the first time to measure preferences over health states in 1973 (Patrick, 1973). Later, it was rescued by Nord (1992) on the basis that it could be more relevant for social choice contexts. There are several versions of the PTO technique (Olsen 1994, Nord et al. 1993, Ubel et al 1998).

## 1. Objectives

The main objectives of the paper are:
To elicit some EQ-5D health states values using a societal technique (PTO).
To check people concern about severity of illness when valuing equal gains from different starting points in the scale.
To assess the effect on values of limited potential health improvements.

## 2. Methods

A sample of 51 persons (26 males and 25 females, mean age 43) was selected from the general population of Navarra (Spain). The exercise was done through face to face interviews. Special boards were designed for the different PTO exercises following Furlong et al. (1990).

Eight EQ-5D health states were selected following two different criteria: 1) states self assessed in a real context by women undergoing breast cancer treatment and with different levels of severity to prevent using unrealistic combinations of the different items of the five EQ-5D dimensions(Gaminde y Cabasés 1996); and 2) the states had to be equally distanced in a known tariff (TTO York) to lie at similar intervals all along the 0-1 scale. These states were: State 11121, state 11122, state 11222, state 12122, state 22222, state 11113, state 11223, and state 11232.

The schedule of the interview comprised the following: 1. Ordering the 8 EQ-5D health states previously selected . 2. Following that order, individuals had to answer to the three different tasks proposed: Values of each pair of health states; preference for severity and limited potential improvement (see appendix 1 for the schedule). Interviews lasted for about one hour.

The calculation of the utilities of the different health states used in the first part of the experiment was done through a chain calculation by doing PTO exercises between close health states and anchoring the last ordered state for each individual to a known value. Two anchors were used: one concatenating the last ordered state with the value attributed by each individual to restore from immediate death, the state "death" arbitrarily fixed at 0, and the other giving the last ordered state the value in the York TTO tariff (Dolan et al. 1996).

## 3. Results.

### 3.1 Ranking of the states

In Table 1 it is shown the ordering of the 8 selected states. There is a great dispersion in the ordering of states except for the two highest rated health states, what implies a low degree of agreement between individuals as to which state is preferred to which. This could affect the actual PTO valuations of the EQ-5D states.

Table 1. Ordering of the 8 selected health states (N= 51, in %)

| | First | Second | Third | Fourth | Fifth | Sixth | Seventh | Eighth | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| 11121 | 94 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 100 |
| 11122 | 0 | 84 | 14 | 0 | 2 | 0 | 0 | 0 | 100 |
| 11222 | 0 | 0 | 33 | 55 | 12 | 0 | 0 | 0 | 100 |
| 12122 | 0 | 2 | 29 | 31 | 22 | 8 | 8 | 0 | 100 |
| 22222 | 0 | 0 | 0 | 2 | 34 | 24 | 16 | 24 | 100 |
| 11113 | 6 | 8 | 23 | 10 | 12 | 22 | 19 | 0 | 100 |
| 11223 | 0 | 0 | 0 | 0 | 12 | 20 | 37 | 31 | 100 |
| 11232 | 0 | 0 | 0 | 2 | 6 | 26 | 20 | 46 | 100 |
| TOTAL | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 101* | |

***Excess due to rounding**

3.2.3.- Descriptive analysis of the distribution of PTO valuations.

Table 2 Values of EQ-5D health states using the PTO technique and anchoring in last ordered health state valued according to TTO York

| | mean | median | SD |
|---|---|---|---|
| 11121 | 0,9843 | 0,9999 | 0,0459 |
| 11122 | 0,9745 | 0,9995 | 0,0714 |
| 11222 | 0,9487 | 0,9980 | 0,1265 |
| 12122 | 0,9350 | 0,9961 | 0,1264 |
| 22222 | 0,7706 | 0,9265 | 0,2444 |
| 11113 | 0,9138 | 0,9760 | 0,1570 |
| 11223 | 0,6242 | 0,6880 | 0,3347 |
| 11232 | 0,4964 | 0,3625 | 0,3628 |

Table 3. Values of EQ-5D health states using the PTO technique and anchoring in death.

| | Mean | Median | SD |
|---|---|---|---|
| 11121 | 0,9913 | 0,9999 | 0,0408 |
| 11122 | 0,9849 | 0,9999 | 0,0685 |
| 11222 | 0,9770 | 0,9999 | 0,0989 |
| 12122 | 0,9706 | 0,9998 | 0,1047 |
| 22222 | 0,9394 | 0,9919 | 0,1567 |
| 11113 | 0,9747 | 0,9977 | 0,1011 |
| 11223 | 0,9345 | 0,9775 | 0,1520 |
| 11232 | 0,9026 | 0,95 | 0,2152 |

Table 2 and 3 show the mean, median and standard deviation of the distribution of PTO valuations in the sample, using both anchorings (death, and TTO York). Note that all means and medians of the death-anchored valuations are above 0.9 (table 2). Considering we are working on a scale from 0 to 1, most of these PTO valuations are extraordinarily high, and differ very little (sometimes in terms of a tenth of a thousandth of a point). The standard deviation of valuations varies greatly, but a tendency can be spotted: in general and in both anchorings, the higher the median PTO valuations, the smaller the dispersion of values around the mean.

An analysis of the distribution of the PTO valuations via box and whisker diagrams confirms the compression of the elicited utilities at the upper-end of the 0-1 scale. Also, it picks up the effect of the initial ordering of states in the resulting values of the chain that was used to calculate the PTO valuations of those health states. The states that were ordered last by the individuals in our sample often yield a very high utility, due to the fact that *individuals give a very high social value to saving lives relative to curing individuals in poor health*. Ubel et al (1998) reach similar conclusions.

3.2.5.- Severity of the initial states.

The objective of the second part of the project was to test whether the preferences for two health programs was affected by the severity of the initial state. Two similar PTO exercises were performed, one of which consisted of asking individuals to answer the following question:

*Suppose health program A, which would improve the health of 100 individuals from state 12122 to state 11121. ¿How many individuals would you treat with health program B, which allows individuals to improve from state 11113 to state 12122, in order to be indifferent between programs A and B*? According to the York TTO tariff (Dolan, 1996) moving from state 11113 to state 12122 brings about a similar utility improvement than moving from state 12122 to state 11121 (approximately 0.2 points in a scale from 0 to 1). Program B, however, would treat patients in worse health than A (state 11113, initial state of program B, has utility level of 0.4 in the York tariff, whilst state 12122, initial state of program A, has a utility of 0.6).

These exercises allow us to obtain a measure of the *preference for severity* (PS) of the individuals, which expresses the relative social value each individual gives to the program that treats patients in a worse initial state (program B) with respect to the program that treats patients in a better initial state (program A).

The PS is directly derived from the equivalence of persons PTO exercise; in this experiment it takes values in the [0,1] interval. If PS is equal to 1, the individual in question gives the same social value to the same health improvement, independently of the initial state. That is, he/she expresses no social preference for those patients in the worse state, with respect to those in the better state, when it comes to distributing marginal QALYs between the two groups. He/she has a *null preference for severity*.

In turn, if PS tends to zero, the individual gives a very high social value to the same health improvement when it goes to those patients in a worse initial state relative to

those patients in better health. He/she expresses a very high social preference for those individuals in a worse initial state in the distribution of marginal QALYs between the two groups (worse and better initial state).

Table 4 shows the different range of values (and the individuals' responses) of the measure of the preference for severity resulting from both exercises[1]

Table 4. Measure of the preference for severity (PS).

| | | EXERCISE 1 | | EXERCISE 2 | |
|---|---|---|---|---|---|
| Range of values | PG | N | % | N | % |
| 0-0,24 | very high | 9 | 24,3% | 7 | 21,2% |
| 0,25-0,49 | High | 4 | 10,8% | 1 | 3,0% |
| 0,5-0,74 | Low | 1 | 2,7% | 3 | 9,1% |
| 0,75-0,99 | Very low | 3 | 8,1% | 1 | 3,0% |
| 1 | null | 20 | 54,1% | 21 | 63,6% |
| Total | | 37 | 100,0% | 33 | 100,0% |

20 individuals (54.1%) in Exercise 1 and 21 individuals (63.6%) expressed a null preference for the initial state; they were indifferent to the severity of the initial state when assigning marginal QALYs to the two groups of patients in program A and B. If we define equity as *prioritising treatment for those patients in a worse state of health*, this means that more than 50% of the individuals that answered to these questions expressed no equity concerns.

In turn, up to 9 individuals (24.3%) in Ex.1 and 7 individuals in Ex.2 (21.2%) expressed a high social utility for treating those patients in a worse initial state (program B) versus treating those in a better initial state (program A) when assigning marginal QALYs to the two groups of patients. In terms of the previous definition of equity, we can thus say that about 20-25% of the individuals in our sample that answered to the two PTO exercises showed strong equity concerns when eliciting social preferences.

3.2.6.- Limits to potential health improvements.

The third part of our project aimed at testing whether individuals are sensitive to limitations in the potential health gain of some individuals. If they do, they would value equally different health improvements from a same initial health state, when a group of patients cannot reach the same health levels due to specific conditions (patients with handicaps, for example). Three similar PTO exercises were performed, of which one involved asking the individuals in our sample to answer the following question:

[1] Note that the number of individuals that answered to the questions posed in these exercises is lower than the sample size. This is due to the fact that the states that were evaluated were ordered by some inversely to the resulting ordering in the York tariff elicitation. For these individuals, the comparisons of states implied in the PTO exercises were not possible.

Exercise 1. Program A can improve the health of 100 individuals from state 11223 to state 11221. ¿How many individuals would you treat with health program B, which permits individuals to improve from the same state 11223 to state 11113 (which has lower utility than 11121), in order to be indifferent between programs A and B, taking into account that in the second case state 11113 is the maximum health level obtainable by the patients? According to the York TTO tariff (Dolan, 1996) moving from state 11223 to state 11121 (program A) brings about a different change in utility than changing from state 11223 to state 11113 (approximately 0.6 versus 0.2 points in a scale from 0 to 1). Exercise 2 is the same, comparing changes in health from 12122 to 11122 and from 12122 to 11121 (approximately 0.4 versus 0.2 points). Exercise 3 is similar, comparing changes in health from 11232 to 11222 and from 11232 to 11121 (approximately 0.4 versus 0.6 points).

These exercises allow us to obtain a measure of the *preference for the limited potential health improvement* (PLP) of the individuals[2].The PS is directly derived from the equivalence of persons PTO exercise; in this part it takes values in the [0,1] interval. If PLP=1, the individual gives the same social value to a lower health gain in patients with a smaller potential for health improvement (program B) as to a higher health gain in patients with a greater potential for health improvement (program A). He/she then shows egalitarian preferences. If PLP$\rightarrow$0, the individual gives a much higher social to the program that has a higher potential health improvement (program A) versus the program that involves a lower potential health improvement (program B). He/she shows utilitarian preferences.

Table 5 shows the different range of values (and the individuals' responses) of the measure of the preference for the limited potential health improvement resulting from the three PTO exercises.

Table 5. Measure of the preference for limited potential health improvement (PLP): Frequencies and %.

| | | EXERCISE 1 | | EXERCISE 2 | | EXERCISE 3 | |
|---|---|---|---|---|---|---|---|
| range of values | PLP | N | % | N | % | N | % |
| 0-0,24 | very low | 27 | 52,9% | 20 | 39,2% | 19 | 37,3% |
| 0,25-0,49 | low | 7 | 13,7% | 6 | 11,8% | 10 | 19,6% |
| 0,5-0,74 | high | 5 | 9,8% | 8 | 15,7% | 8 | 15,7% |
| 0,75-0,99 | very high | 6 | 11,8% | 12 | 23,5% | 12 | 23,5% |
| 1 | maximum | 6 | 11,8% | 5 | 9,8% | 2 | 3,9% |
| total | | 51 | 100,0% | 51 | 100,0% | 51 | 100,0% |

For all three PTO exercises: Exercise 1 (34 individuals, 66.6%), Exercise 2 (26 individuals, 51%) and exercise 3 (29 individuals, 56,9%), most expressed a low or very low preference for the limited potential health improvement. That is, they showed utilitarian preferences. This is not an absolute tendency, given that there is a good number of individuals (12, 23.6%, for Exercise 1; 17, 24.3% for Exercise 2; and 14, 27.4%, for exercise 3) that expressed more egalitarian preferences.

[2] Full health was not included as one of the higher states in these three PTO experiments in order to avoid the potential bias associated with curing as output of treatment.

**4.- Discussion.**

We have compared the estimations of the health state utilities of this PTO exercise with the (available) valuations of the same states derived from other studies, with the purpose in mind to draw more general conclusions about our study results. The chosen studies are (see References): Pinto (1997), Dolan et al (1996), Gaminde and Cabasés (1995), Rué and Badía (1995).

Table 6 displays the different valuations.

Table 6. Valuations of eight health states obtained in different experiments.

| | Our sample | | Pinto* | Dolan et al | EQ-5D | Gaminde et al | Rué et al |
|---|---|---|---|---|---|---|---|
| VALUE | Anchoring A (median) | Anchoring E (median) | Mean | Median | Median | median | median |
| 11121 | 0.9999 | 0.9999 | | 0.93 | 0.8 | 0.65 | 0.65 |
| 11122 | 0.9995 | 0.9999 | | 0.83 | 0.73 | 0.5 | 0.57 |
| 11222 | 0.998 | 0.9998 | 0.9914 | | 0.69 | | 0.49 |
| 12122 | 0.9961 | 0.9997 | 0.9914 | 0.63 | 0.62 | | 0.75 |
| 22222 | 0.9265 | 0.9919 | | 0.5 | 0.52 | | 0.45 |
| 11113 | 0.976 | 0.9977 | 0.9373 | | 0.41 | | 0.56 |
| 11223 | 0.688 | 0.9775 | | | 0.25 | | 0.59 |
| 11232 | 0.3625 | 0.95 | | | 0.16 | | 0.4 |

*Value 0.9914 corresponds to state 12121. Value 0.9373 corresponds to 21312.

The PTO valuations of our sample show the highest values of all. The compression of the values towards the upper end of the 0-1 scale is very high compared with other scaling techniques. One of the hypothesis of our study was that individuals value poor health relatively more highly when the valuations of these states are elicited via techniques that measure social preferences than via techniques that measure individual preferences. However, this compression can be considered extreme when the lowest-valued states reach valuations above 0.9. The explanation might be that individuals give a high social value to saving lives with respect to curing individuals from poor (even extremely poor) states of health. In this line, see Ubel et al (1998).

The second part of this PTO experiment tried to test whether or not equal changes in health are valued (socially) differently at different points in the 0-1 scale. In this sense, the hypothesis that individuals tend to value more highly gains in health for those patients that are in a worse initial state does not hold in this experiment: more than 50% of those individuals that answered to the PTO questions were indifferent between the health gains of the better and the worse off in terms of initial health. However, around 25% of those individuals did show a concern for equality by showing a preference for

treatment to those patients in worse initial health. A possible explanation of these results is that the experiment was not well designed (the health gains that were axiomatically assumed to be equal, following the York TTO tariff, may not actually be so), although it is possible that the health welfare function in this sample is utilitarian (we cannot establish this conclusion, given that many individuals showed a concern for equality).

With respect to Part 3, an analysis of the preferences of the individuals in our sample for treatment to those patients that have a limited potential health improvement due to particular characteristics, most showed utilitarian preferences (valuing more highly the highest health gains), but many individuals showed a concern for treating those patients who cannot improve their health state as much as others. Maybe these are traces of a certain type of utilitarianism with security net, rather than rawlsian or inequity aversion utilitarian functions (of the Cobb-Douglass or log linear type).

Many researchers that work on individual utility elicitation techniques do not support the use of PTO to elicit social valuations of health states. Dolan (1998) points out that through PTO it is impossible to separate individuals' relative weights for at least four different aspects: pre-treatment severity of illness; post-treatment severity; gains in health from treatment; number of people treated.

Thus, Dolan argues that it is not possible to establish what is the appropriate definition of need that is most appropriate in terms of resource allocation. Also, Dolan argues, PTO exercises impose a cognitive overload that affects the validity of answers. He abides for using individual estimations to construct a health welfare function that may incorporate equity considerations (for example, log-linear inequality-aversion functions).

The hypothesis that individuals tend to give a higher value to those improvements in health that affect individuals in worse initial health states, with respect to individuals that are in better health, does not seem to hold in the light of the results of our experiment. More than 50% of the individuals in the sample that answered to this exercise were indifferent between them. However, 25% of these individuals showed a preference for treating those individuals in worse initial health (*preference for severity*). A high inequality aversion in many of the individual valuations does not permit the hypothesis of strict utilitarianism to hold either.

The results of the exercise, in the experiment, that tested individuals' preferences for treating individuals with a limited potential health gain (*preference for the limited potential health improvement)* are in the same line. Most individuals show utilitarian preferences, giving higher value to higher health gains. However, a good number of individuals showed a concern for treating those that cannot improve their health as much as others can. We could be in the presence of utilitarian preferences with a safety net, rather than rawlsian preferences, or inequality aversion.

A qualitative analysis can help explain the abnormally high valuations that were obtained from our sample via PTO. PTO tries to obtain social values of health states by making the individual behave as a decision-maker in a decision that does not affect him/her. However, many respondents seem to have had difficulties to adopt this role. Preferences seem to be imprecise; it would be necessary to go through pre-questionnaire joint work to help design these individual preferences.

People's preferences, particularly with respect to equity concerns, are not immediately accessible and their elicitation can be affected by the way the questions are posed. Thus the importance of exploring how individuals interpret what they are asked and to give them the opportunity of reflecting on their answers. One of the aims of this work is to reinforce the PTO technique for valuing states with discussion groups and previous learning to increase validity of responses.

The PTO technique needs to be improved. From the experiment, no conclusions could be drawn on whether the scale changes when the reference number of people used in the PTO valuations changes (constant proportionality trade off).

It is important to know how honest responses were. It seems probable that strategic responses are more common in PTO valuations than in other types of (individual) valuations. In fact, it seems more socially acceptable to provide virtuous answers (give a higher priority to those in the worse health state) when individuals are asked hypothetical answers about others. This is a well-known bias in the willingness-to-pay literature, but its impact in health state valuations is still unknown.

The PTO technique is used under certainty. A more realistic field to explore is decision-making under uncertainty.

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Annex 1

PTO Exercise

The first part of the exercise involved following three steps:

1) First of all, the person was asked to adopt the role of a decision maker, and was shown some examples of social decisions over health technologies. Then he/she was asked to fill out the EQ-5D questionnaire, in order to get familiar with the different dimensions .
2) Second, he/she was asked to order, from most preferred to least preferred, 8 cards displaying 8 EuroQol health states, 2. If any logical inconsistencies were detected by the interviewer in this process (for example, if someone ordered state 11122 before 11121), the person was asked to reconsider the ordering until a consistent ranking of states was achieved.
3) Third, the individual was shown a board (built according to appropriate standards concerning the design and development of health-utility instrumentation3) which presented: on the left hand side, the two most preferred states by the individual (State 1 and State 2, ordered by the individual first and second respectively); on the right hand side, in a sliding panel, the number of persons that could be restored to perfect health from both states, due to the establishment of two different treatments. Asked to behave like a decision maker, the individual would then be asked if he preferred a) to establish a treatment (X) that cured 100 people in State 1 or b) a treatment (Y) that cured 100 people in State 2. The panel would show, at this point, a scale marking 100. If the individual showed a social preference for X at this point, this part of the experiment would stop. Otherwise, the number of individuals to be cured in b) would be changed to 10, keeping those individuals to be cured in a) constant at 100 (the scale would slide to show graphically the new person trade-off involved). If the individual showed now a preference for X, the number of persons in b) would be shifted in ping-pong (and the scale slid in consequence) until an indifference point was reached by the individual.

The second part of the experiment consisted in having the individual compare the value of gains in health derived from passing from a lower to a higher EuroQol health state after treating two groups of patients whose initial health status differs, where these changes in health are of equal value according to the health indices obtained via TTO in a representative sample of the UK population (Dolan et al, 1996). The individual was thus presented with two pairs of EuroQol states, representing for each group of patients their initial and final health states, and was asked to express his preffered gain in health via the PTO technique we explained before.

[3] **See Furlong, 1990**

The third part of the experiment consisted in presenting the individual with two different health gains for two groups of patients whose initial health state was the same. The difference in health gains was derived from the supposition that one of the two groups of patients could not benefit as much as the other from treatment (due to an additional limitation, for example). The procedure was similar to that of the second part of the experiment.