The impact of parental perspective on TTO utilities

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Abstract

There is anecdotal evidence to suggest that parents of young children are reluctant to trade off their life years in Time Trade-Off (TTO) exercises. Answers such as these would imply that there is little or no social benefit to be gained from alleviating their health problems though clearly the problem here is the method. This is the first study to examine the impact of having young children on individuals' decision making in TTO.

A combined quantitative and qualitative approach is used. The quantitative part consists of eliciting values for four EQ-5D states using VAS and TTO. The qualitative part consists of a semi-structured interview. A sample of 30 new mothers is used.

The TTO values are significantly higher than population values for all health states whilst the VAS values are similar. The qualitative part revealed that most new mothers considered the impact on their children in the TTO exercises. They were trading off their disutility of experiencing the health state, their sense of responsibility, their ability to look after their children given the health problems, and their desire to see their children grow up. Most women indicated that they would have given up more life-years, especially with the more severe health states, if they had to consider only themselves. There was no evidence of non-trading or target setting behaviour, however.

Parental perspective produces an upward shift in TTO. The combined quantitative and qualitative approach was very successful in revealing individuals' decision-making processes in TTO.

Introduction

There is anecdotal evidence to suggest that parents of young children are reluctant to engage in Time Trade Offs (TTO), resulting in estimates of health utilities equal to or close to one (Shiell *et al.*, 1996). This may be caused by at least two different effects:

(i) Parents of young children may attach a different weight to quality of health.

(ii) Parents of young children may have non-linear utility functions for life years, attaching different weights to those life years when their children are young.

These effects can be explained by the hypothesis that health and non-health attributes in parents' utility functions are not mutually independent. For example, they may attach different weights to quality of health because of the consequences it has on their children. That is, they take account of the utility of others (their children) in their TTO responses.

It is important to distinguish between the different effects as they may work in opposite directions. Also, they have different consequences for the elicitation of health utilities. The standard QALY model attaches equal weights to improvements in quality of health across all life years. If individuals attach different values to different stages of the lifecycles, such as the stage during with they have young children, QALYs are not an accurate representation of individuals' preferences. The second effect is problematic as non-linearity results in biased TTO utilities. Elicitation methods that do not pose such a strong assumption on the utility function for life years may therefore be more appropriate in this sample of individuals. As regards the violation of mutual utility independence, it has been argued that the currency used in choice-based elicitation methods such as TTO and SG encourages consideration of non-health attributes (Broome, 1978, Baker and Robinson, 2004). It may therefore be the case that methods such as VAS are more appropriate. However, it should be noted that whether some non-health attributes, such as utility of others, should be incorporated in health utilities is very much a matter of debate (Baker and Robinson, 2004).

Little is known about how a parental perspective impacts TTO exercises. To fully explore the different effects, individuals' decision making processes during the TTO exercises need to be examined. This requires a combined quantitative and qualitative

approach. The use of the combined approach is becoming increasingly popular within the health economics literature and many authors have identified the use of qualitative methods during elicitation exercises as an important area for future research (Dolan, 2000, Baker and Robinson, 2004). The paper also investigates the *extent* to which having young children impacts TTO values by comparing the elicited TTO values with normative data and with Visual Analogue Scale (VAS) values. These comparisons will indicate whether having young children is influencing TTO values in particular or whether it is similar across valuation methods. The latter will also be explored during the qualitative part of the study.

TTO and parental perspective

TTO exercises are performed within the framework of QALYs which assume that health states have two dimensions, namely the quality of the health state (Q) and the quantity or duration of the health state (T). Utility of (Q,T) is equal to: $U(Q,T) = H(Q)G(T)$ where H and G are utility functions of Q and T respectively. The standard model requires three assumptions, namely utility independence of duration and quality of health, constant proportional trade-off, and risk-neutrality with respect to duration (Pliskin *et al.*, 1980). $H(Q)$ is measured on a scale between 0 (death) and 1 (full health). In TTO this is estimated by obtaining marginal rates of substitution between quality of health (Q) and life years (T). A value for T_2 is elicited such that: $(Q_1, T_1) \sim (Q_{FH}, T_2)$ where Q_{FH} indicates full health and $T_1 > T_2$, and $Q_1 < Q_{FH}$ is the health state being evaluated. Assuming that $G(T)$ is linear, that is $G(T)=T$, $H(Q_1)$ can be estimated by:

$$H(Q_1) = \frac{T_2}{T_1}$$

Impact of parental perspective on H(Q)

Having young children may impact individuals' utility function for quality of health ($H(Q)$). Loomes and McKenzie (1989) argued that "a young single adult may place a lower weight on good health now than on good health a few years ahead, when he she may be raising a young family; the weight placed on good health in years beyond that, when the children have grown up, may then fall". This effect may be caused by the consideration of the consequences of their quality of health on their children.

Impact of parental perspective on G(T)

Having young children may impact individuals' utility function for life years ($G(T)$). They may attach higher or lower weights to life years as compared to individuals without children. This has no immediate consequences for the estimation of TTO utilities as long as the linearity assumption is satisfied.[1] However, it could be hypothesized that a high weight is attached to life years when their children are young in particular and less so when their children are older. In more extreme cases, individual may exhibit hierarchical preferences. An example of hierarchical preferences is target setting where parents estimate a target life expectancy that will see their child through to maturity or some other 'life event' such as graduation or marriage. They are unwilling to trade off any time until this target is met irrespective of the severity of the health state. Again, these effects may be mainly caused by the consideration of others, that is, the consequences of loss of life years on their children.

Another way in which having young children may influence individuals' utility function for life years is through time preference. There is some evidence that having children increase an individual's rate of time preference (Cropper *et al.*, 1991, Cairns, 1994, Cairns and van der Pol, 1997, Lazarro *et al.*, 2002). Time preference violates the linearity assumption in TTO and therefore results in biased health utilities. It should be noted that the majority of individuals exhibit time preferences and therefore a time preference bias is likely to be present in most studies eliciting TTO utilities. However, the *size* of the time preference bias is a direct function of the size of the time preference rate and this bias may therefore be larger for individuals with young children.

Methods

A combined quantitative and qualitative approach is used. In the quantitative part, VAS and TTO values are elicited for 4 different health states. The two main objectives are: (1) for participants to undertake the TTO and VAS exercises so that their decision making processes can be explored in the qualitative part; and (2) to obtain TTO and VAS values for comparison with normative data. The quantitative part is followed by a semi-structured interview.

Health states

The health states are described using the EQ-5D instrument which is of demonstrated validity and reliability (Brooks, 1996). The main advantage for the purposes of this study is that normative data on values of the EQ-5D states are available (Dolan *et al.*, 1996, Gudex *et al.*, 1996). Four EQ-5D health states are selected: two minor (11121 and 11112); one intermediate (22222); and one severe state (11133). Different degrees of severity were chosen to assess whether being limited in terms of one's ability to look after one's children because of health impacts decision making differently.

The duration of the health states is 20 years. This enables investigation of the hypothesis that individuals with young children estimate a target life expectancy that will see their child through to maturity (assuming that this is perceived to be around 18 years of age). The disadvantage of this duration is that the normative data are based on 10-year durations (Dolan *et al.*, 1996). There is some evidence to suggest that TTO and VAS values decrease as a function of duration (Dolan, 1996). If lower values were to be found for the study sample as compared to the population sample, this may be the result of the difference in duration rather than the impact of having young children.

VAS

The VAS scale used ranges from 0 (worst imaginable health) to 100 (best imaginable health). Participants were first asked to rank from best to worst the four EQ-5D states described above, as well as perfect health (11111), the most severe EQ-5D state (33333) and immediate death. The health state ranked as best by the participant was then placed at 100 and the health state ranked as worst was placed at 0. Participants were then asked to place the remaining health states relative to these two points.

TTO

A choice bracketing procedure was used to obtain the number of years in perfect health that is equivalent to 20 years in each of the chosen health states. The number of years in perfect health is presented in a 'ping-pong' fashion. If participants are

[1] It does violate the assumption of stable lifetime preferences in the QALY model but does not

unwilling to trade off the minimum amount (2 years), they are asked whether they want to trade off one year and this is further reduced to months and days if they continue to prefer 20 years in poor health.

Comparison with normative data

The largest data set available is the UK population data (Dolan *et al.*, 1996). International comparisons suggest there is very little difference between citizens of different western countries in the mean value assigned to health states (EuroQol Group, 2000). The mean TTO and VAS values for the EQ-5D states elicited in the current study are compared with the mean UK population values using a 2-sample t-test (Bland, 1995). The significance level of the test statistics is adjusted using the Bonferroni method to allow for the effect of multiple testing (Bland, 1995). There are eight different t-tests. Differences between mean values are significantly different at 0.05 level if the p-value is less than 0.006 or t-statistic larger than 2.75. In addition to statistical significance, 'quantitative' significance is also assessed. There are no clear guidelines as to what constitutes a quantitative significant difference but 0.05 has often been interpreted as a medium effect size (O'Brien and Drummond, 1994).

Qualitative methods

The qualitative component of the study consisted of a semi-structured interview with a series of open-ended questions on the issues to be explored. These issues partly depend on the pattern of response in the TTO exercise. Table 1 shows the topic guide. A basic guide was formulated first and the guide was further developed and reviewed after each couple of interviews.

The semi-structured interviews are digitally recorded and then described. The qualitative data are examined using thematic analysis (Miller and Huberman, 1993). This method identifies the main concepts in a systematic way and then categorizes and develops these concepts into main themes.

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necessarily result in biased TTO utilities.

Table 1. Topic Guide

What sort of things were you considering when answering the questions? What was driving your answers?
Would you have made different choices if you only had to consider yourself?
What was going through your mind when you were thinking about the years you were giving up?
Would it have made a difference if life expectancy was longer say 40 years?
Did you have a minimum amount of time in mind that you would always want to live and would never want to give up however severe the health state?
I noticed that you placed these health states below good health on the scale but that you did not give up any time to avoid the states. A lot of people do as you did. Can you tell me a little more about why this might be the case?
I noticed that you placed these health states below each other on the scale but that you gave up the same amount of time to avoid the states. A lot of people do as you did. Can you tell me a little more about why this might be the case?

Data

Women who participated in the Community Perinatal Care trial in Calgary were recruited to the study. The face-to-face interviews were carried out at a venue of the participant's choosing (either in her own home or at the university). A sample size of 30 was used which is sufficient to detect a statistically significant difference of 0.05 in TTO values between the study sample and normative data. This is based on a standard deviation of 0.3 (Furlong *et al.*, 1990) and the formula provided by Lwanga and Lemeshow (1991). The sample size was also sufficient for the qualitative part. No new themes were emerging after around 10 interviews indicating that saturation was reached.

Appendix 1 shows some descriptive statistics of the sample. The mean age of the participants is around 33 and ranges from 25 to 40 years. The mean age of the youngest child is 14 months and ranges from 5 to 19 months. Half the sample has only one child, 37% has two children and 13% has 3 or 4 children. The age of the oldest child of women who have more than 1 child ranges from 2 to 7 years.

Results

Quantitative

Table 2 shows descriptive statistics of the VAS and TTO values for the four EQ-5D states. The VAS values for the 18 participants that ranked the most severe health state (33333) as worse than death, are adjusted in such a way that immediate death represents zero[2]. The mean adjusted VAS values range from 0.85 to 0.27 depending on the health state. The mean TTO values range from 0.94 to 0.61. The range of TTO values include 1 for three of the four health states indicating that some participants were unwilling to give up any life years. The number of non-traders are relatively low: 9 (30%) in case of 11121; 12 (40%) in case of 11112; and 2 (7%) in case of 22222.

Table 2. VAS and TTO values

	STUDY SAMPLE				UK DATA			
	Mean	Std dev	Median	Range	Mean	Std dev	Difference in means	t-value
VAS*								
11121	0.85	0.09	0.87	(0.59 – 0.95)	0.81	0.21	0.04	2.26
11112	0.78	0.11	0.79	(0.50 – 0.95)	0.81	0.21	-0.03	-1.41
22222	0.47	0.15	0.49	(0.10 – 0.79)	0.45	0.37	0.02	0.65
11133	0.27	0.16	0.25	(0.00 – 0.68)	0.25	0.55	0.02	0.57
TTO								
11121	0.92	0.08	0.95	0.75 - 1.00	0.85	0.25	0.07	4.34
11112	0.94	0.08	0.95	0.70 - 1.00	0.82	0.29	0.12	7.20
22222	0.77	0.13	0.78	0.45 - 1.00	0.50	0.49	0.27	9.25
11133	0.61	0.20	0.65	0.10 - 0.90	-0.05	0.61	0.66	15.62

* excludes 1 participant who assigned 100 to death

Table 2 also shows the mean TTO values and adjusted VAS values for the UK population data (Dolan *et al.*, 1996, Gudex *et al.*, 1996). The VAS values are very similar and none of the differences are statistically significant at a 5% level (t-value greater than 2.75). The mean TTO population values are substantially lower indicating that having young children produce an upward shift in health state evaluations. The differences are larger for the more severe states. All of the

[2] All participants ranked 11111 as the best health state and no adjustment of VAS values is therefore required at the upper end of the scale.

differences in TTO values are statistically significant at 5% level. In terms of quantitative significance, none of the differences in the VAS values are greater than 0.05 whilst all of the differences in TTO values are.

Qualitative

Impact of utility function of health (*H*(*Q*))

> "*You know the biggest thing I was considering with this one [11133] is that extreme pain or discomfort or being extremely anxious or depressed doesn't affect just me, it would affect my whole family*"

Especially with the more severe states, participants were considering how the physical and mental problems would impact their ability to be a good parent:

> " *part of what was going through my mind is being a new mum.…… how old would he be when all this happened and then you know if I was for example in extreme pain or extremely depressed, what kind of mum would I be, like would he be better off that I was here or not*"

> "*if I couldn't move and walk and do things for myself what good am I to the kids*"

In addition to feeling unable to be a good parent, some health states were perceived as so limiting that they would result in being a burden on their children and the rest of their family:

> "*I wouldn't ever want to hold back my children…*"

> "*worry for my family that they have to take care of me*"

In contrast, even quite severe health states were perceived as less problematic because of the expected level of support that they would received from their children and family:

> "*…like I look at confined to bed, unable to wash, unable to perform usual activities and my thought is you know my husband can help me do a lot of that stuff*"

> "*if I needed someone to take care of me or dress me, I felt that yeah I could live longer because I've got my husband and my child to help to take care of me"*

Impact on utility function of life years ($G(T)$)

An important theme was parental responsibilities. Individuals felt a sense of duty in terms of being around to look after one's children:

> "*when it comes to her there's a job that still needs to be done*"

> "*I wouldn't want to be gone right now because he needs somebody to take care of him you know. Not that 10 years would be long enough either but you know the selfish part of I can't imagine being in extreme pain or discomfort it would just be awful. You know how long could I put up with it on his behalf…*"

Related to the above is the recognition of different life stages. The importance of life years varies across these stages:

> "*Well I was going through what my dad is going through right now…. On the other hand…… 20 years of my life versus another 20 years for him would be hugely different…*"

> "*Well in 36 years these kids would be on their own and you know if having their own family I wouldn't think they would need me as much*

so I would be willing to give up some more you know not so happy years for happier years yes"

There is also a sense of a loss in terms of not being able to see one's children grow up:

"*I was thinking about watching my children grow and seeing them changing in their lives…*"

"*just not to be there to see my kids graduate or something like that*"

"*I want to watch my baby grow up*"

Non-trading

The non-trading behaviour that was present in the study was mainly a result of the ill-health being perceived as too minor and/or anticipated adaptation:

"*to be moderately anxious or depressed to me isn't worth trading, like I think that's something you can live with….*"

"*..there are strategies and medications and counsellors and that will help you deal with anxiety and depression and I think that you could learn to cope… you could work around it in your day-to-day life"*

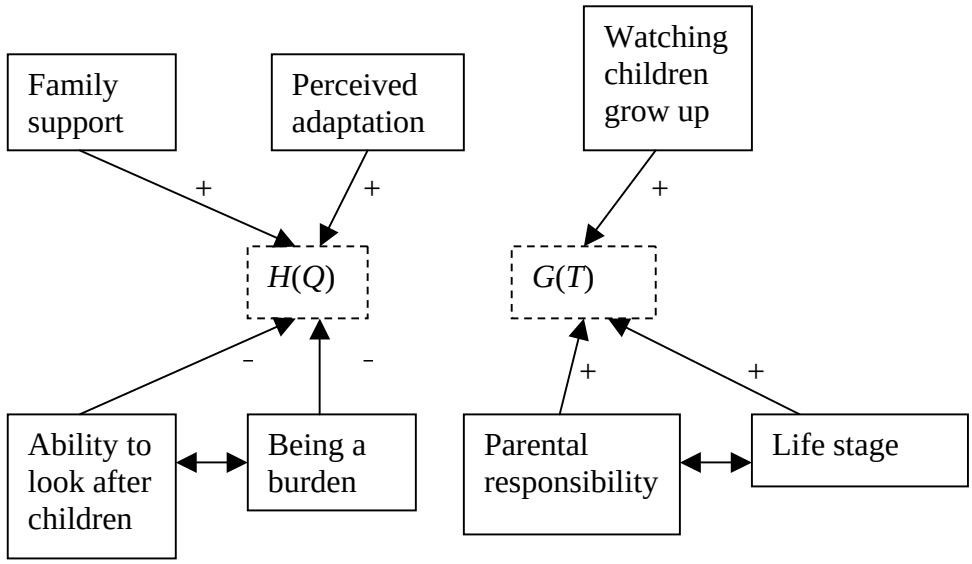
VAS versus TTO

When placing health states on VAS the impact of children was not being considered.

"*I was thinking more along the lines of what would be best for me when I was looking at this [VAS] where when I was doing this [TTO] my family was absolutely way more important in my mind*"

Figure 1 summarizes the different influences of a parental perspective on TTO utilities.

Figure 1.



Conclusion

The aim of this paper was to explore the impact of a parental perspective on TTO utilities. A combined quantitative/qualitative approach was used. VAS and TTO values were elicited from a sample of 30 new mothers for four EQ-5D states with different degrees of severity. The quantitative results showed that the mean TTO values were significantly higher for the study sample than for a sample of the general population drawn in the UK, whilst none of the differences in VAS values were significant. This suggests that having young children impacts TTO utilities but not VAS values. However, the sample is different in terms of other characteristics as well (such as age and marital status) as compared to the general population sample. Also, the duration of the health states was longer in the current study.

The qualitative part, the semi-structured interview, clearly demonstrated that the impact of both quality of health and loss of life years on others play an important role in TTO exercises. Apart from their disutility of experiencing the health state, individuals were trading off their sense of responsibility, their ability to look after their children given the health problems, and their desire to see their children grow up. Most women indicated that they would have given up more life-years, especially with the more severe health states, if they had to consider only themselves. There was

some indication of non-linear utility functions for life years in that several participants were willing to give up more life years if the duration were to be changed to 40 years. Some women referred to the relative importance of life stages which can explain this result. However, it may also be caused by a positive time preference rate which was not thoroughly explored in the current study. Another indication of non-linear utility functions for life years is the differences between the study and normative values for more severe states were much larger than for the minor states. This may because life years when their child is young are valued at such a high rate that the health state has to be extremely severe before these years are given up. There was no evidence of the utility of these life years being infinite though, that is, there was no evidence of target setting behaviour. This paper has used the term of parental perspective throughout but has only focused on new mothers. It would be very interesting to explore whether the same effects are present in TTO exercises with new fathers.

The use of parental utilities would result in a situation where interventions to promote the health of mothers would be valued less than those aimed at the general population. In contrast, the qualitative data suggest that individuals attach a higher weight to quality of health because of the consequences impairments may have on their children. The problem here is the currency used to measure quality of health and it raises questions about the use of TTO to elicit health utilities from parents with young children. Some may argue that consideration of others should be taken into account in health utilities. However, the use of TTO is still problematic because the consideration of others seems to impact individuals' preferences for life years more than for quality of health. It may therefore be more appropriate to use VAS or general population TTO values and place different weights to quality of health improvements during different stages of individuals' lifecycles when estimating QALYs.

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Appendix 1. Descriptive statistics of sample

	N	%
No of children		
1	15	50
2	11	37
3	3	10
4	1	3
Age of youngest child		
5 - 12 months	10	33
13 - 19 months	20	67
Age of oldest child (if more than 1 child)		
2 years	3	
3 - 5 years	7	
6 - 7 years	5	

	Own		*Partner*	
	N	%	N	%
Age				
25 - 30 years	9	30	4	13
31 - 35 years	14	47	9	30
36 - 40 years	7	23	12	40
40 - 47 years	0	0	4	13
Education				
high school diploma	4	13	3	10
trade, technical vocational/ business college	6	20	10	33
undergraduate/professional degree	14	47	10	33
postgraduate degree or higher	6	20	6	20