Eliciting individual preferences for end-of-life treatments

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Plan

- Background and Aim of the Study
- The Study: Guiding Framework, Empirics
- Reflection/Conclusions
Introduction

POLICY

- January 2009, NICE indicated might be appropriate to recommend use of treatments for terminal illness even if cost/QALY > usual range.
- Very limited evidence whether giving priority to end-of-life treatments is in accordance with preferences of members of the general public.

→ Are current allocative decisions in UK NHS efficient?
→ Does it matter? Yes – increasing emphasis on “benefits”, “value-based pricing” etc. At some point...BCA?

AIM OF THIS PAPER

to develop a method to collect individual preferences, from an ex ante perspective, on trade-off between extensions to life expectancy in normal health & improvements in health state if to become terminally ill. (n=98; Newcastle upon Tyne)
Introduction (cont.) & Background

- Examined 17 studies, mixed findings, most from societal perspective, 3 from individual perspective, using WTP

METHOD

- Dismiss money/individual WTP in relation to end-of-life decisions “Dead Anyway Effect” (Pratt & Zeckhauser, 1996)
- Instead use a variant of the risk-risk trade-off method
  - An indirect method to estimate relative valuation of interventions
  - Lowers the cognitive burden by comparing more similar “commodities”

REQUIREMENTS FOR MEANINGFUL TRADE-OFFS Nielsen et al, 2010, JRU)
- Respondents understand how changes in life expectancy are generated by small changes in the probability of survival over a lifetime; in particular, it is not an add-on at the end of life
GUIDING FRAMEWORK. NO LIFE-LIMITING ILLNESS, LIFE SPENT IN “NORMAL” HEALTH

Life expectancy (LE) is defined as: $\text{LE} = \int S(t)dt$

where $S(t)$ is the “Survival function

$LE_{40} = 10(1 - P_{40}) + 10(1 - P_{40})(1 - P_{50}) + 10(1 - P_{40})(1 - P_{50})(1 - P_{60}) + \ldots$

where $P_i$ (hazard rate) denotes the probability of dying at the beginning of the $i^{th}$ decade, conditional on having survived until then
Health adjusted life expectancy (HALE) weighs each year of life expectancy by the appropriate health status in each year.

Existing hazard rates for a given decade, $P_i$, are divided between $p_i$ the hazard rate of dying of any other illness in that decade and $q_i$ the hazard rate of dying of a terminal illness in that decade.

$$HALE = 10w(1 - p_{40} - q_{40}) + q_{40}EoL + (1 - p_{40} - q_{40})(1 - p_{50} - q_{50})10w + q_{50}EoL + ...$$

where $Eo$ the time spent suffering from the terminal illness and $w$ is the quality weight given to each year with no terminal illness.
Part 1
Learning experiment

Part 2
Hypothetical choices over different ways of generating a given HALE gain
Figure 3. Depiction of a Game in the Lottery Experiment

Bag 1
White: 982
Purple: 9
Orange: 9

Bag 2
White: 958
Purple: 21
Orange: 21

Bag 3
White: 902
Purple: 49
Orange: 49

Bag 4
White: 754
Purple: 123
Orange: 123

Bag 5
White: 406
Purple: 297
Orange: 297

- White card: 10.0 token(s) and you can progress to next bag
- Purple card: 0.0 token(s) and the game ends
- Orange card: 0.5 token(s) and the game ends
- The number of purple and orange cards increases from bag to bag; but the total number of cards is always 1000 in each bag.

Please input the code to continue

<table>
<thead>
<tr>
<th>Age^1</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
<th>70-80</th>
<th>80-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total hazard rate (p_i + q_i)</td>
<td>18/1000</td>
<td>42/1000</td>
<td>98/1000</td>
<td>246/1000</td>
<td>594/1000</td>
</tr>
<tr>
<td>Probability of death by any other cause (p_i)</td>
<td>9/1000</td>
<td>21/1000</td>
<td>49/1000</td>
<td>123/1000</td>
<td>297/1000</td>
</tr>
<tr>
<td>Probability of terminal illness (q_i)</td>
<td>9/1000</td>
<td>21/1000</td>
<td>49/1000</td>
<td>123/1000</td>
<td>297/1000</td>
</tr>
</tbody>
</table>
Part 1
Learning experiment

Part 2
Hypothetical choices over different ways of generating a given HALE gain
Figure 2. The three different programmes

- RR: a permanent constant absolute risk reduction of 4/1000 in probability of death \( \omega \ (\omega \in (-p,0)) \)
- H25: a change the End-of-Life state from 1 year in 25% health to 3 years in 50% \( (\delta) \)
- H50: a change the End-of-Life state from 1 year in 50% health to 2.5 years in 75% \( (k) \)
\[ HALE_{RR} = 10(1-(p_{40}+\omega) - q_{40}) + q_{40}EoL + (1 - (p_{40}+\omega) - q_{40}) \ast ((1 - (p_{50}+\omega) - q_{50})10 + q_{50}EoL) + \ldots \]

\[ HALE_{H25} = 10(1 - p_{40} - q_{40}) + q_{40}(EoL+\delta) + (1 - p_{40} - q_{40}) \ast ((1 - p_{50} - q_{50})10 + q_{50}(EoL+\delta)) + \ldots \]

\[ HALE_{H50} = 10(1 - p_{40} - q_{40}) + q_{40}(EoL+\kappa) + (1 - p_{40} - q_{40}) \ast ((1 - p_{50} - q_{50})10 + q_{50}(EoL+\kappa)) + \ldots \]
Methodology

“In the second part, you are going to make choices between life expectancy and health related quality of life”

Respondents were...

- introduced to concept of Life Expectancy
- given LE figures for
  - 40-year-old male (80, ie remaining LE is 40 years)
  - 40-year-old female (84, ie remaining LE is 45 years)
- introduced to health related quality of life
"health related quality of life was introduced"
will look at two ways that life expectancy and health related quality of life can be changed.

- reduce the risks of dying (in each decade)
  (same as changing purple cards into white and thus increasing chances of progressing)

- improve health state in the period that precedes death
  (same as increasing the number of tokens received from drawing an orange card).
"Two different [baseline] health states were used to describe the illness preceding death; 25% and 50% full health."
If $W \sim Z$ move on
If $W \succ Z$ option $W$ made worse
If $W \prec Z$ option $W$ made better
If $X \sim Y$ move on.
If $X > Y$ option X made worse.
If $X < Y$ option X made better.

**QU: Respondents choose between RR and H50**

### X vs Y

<table>
<thead>
<tr>
<th>Decade</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
<th>70-80</th>
<th>80-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>New risk of dying</td>
<td>5/1000</td>
<td>17/1000</td>
<td>45/1000</td>
<td>119/1000</td>
<td>293/1000</td>
</tr>
<tr>
<td>Risk of 'illness then death'; 1 year in 50% health</td>
<td>9/1000</td>
<td>21/1000</td>
<td>49/1000</td>
<td>123/1000</td>
<td>297/1000</td>
</tr>
</tbody>
</table>

### OR

**H50**

<table>
<thead>
<tr>
<th>Decade</th>
<th>40-50</th>
<th>50-60</th>
<th>60-70</th>
<th>70-80</th>
<th>80-90</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in illness before death</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk of dying</td>
<td>9/1000</td>
<td>21/1000</td>
<td>49/1000</td>
<td>123/1000</td>
<td>297/1000</td>
</tr>
<tr>
<td>Risk of 'illness then death'; 2½ years in 75% health</td>
<td>9/1000</td>
<td>21/1000</td>
<td>49/1000</td>
<td>123/1000</td>
<td>297/1000</td>
</tr>
</tbody>
</table>

1 year in 50% health $\rightarrow$ 2½ years in 75% health.
Results

Table 4. Choices

<table>
<thead>
<tr>
<th>Baseline End-of-Life State</th>
<th>H50RR</th>
<th>H25RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred Risk Reduction (RR)</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>Preferred End-of-Life (EoL)</td>
<td>52</td>
<td>47</td>
</tr>
<tr>
<td>Indifferent</td>
<td>12</td>
<td>11</td>
</tr>
</tbody>
</table>

“larger proportion of respondents preferred a change to EoL rather than the ongoing risk reduction”
### Table 5. Individual choice pattern

<table>
<thead>
<tr>
<th>Choice Pattern</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>H50&gt; RR and H25&gt;RR</td>
<td>33</td>
</tr>
<tr>
<td>RR&gt;H50 and RR&gt;H25</td>
<td>21</td>
</tr>
<tr>
<td>RR=H50=H25</td>
<td>8</td>
</tr>
<tr>
<td>H50&gt; RR and RR&gt;H25</td>
<td>17</td>
</tr>
<tr>
<td>RR&gt;50 and H25&gt;RR</td>
<td>12</td>
</tr>
<tr>
<td>Preference for EoL in one choice and indifferent in other choice</td>
<td>4</td>
</tr>
<tr>
<td>Preference for RR in one choice and indifferent in other choice</td>
<td>3</td>
</tr>
<tr>
<td>SUM</td>
<td>98</td>
</tr>
</tbody>
</table>
### Table 6. Switching points

<table>
<thead>
<tr>
<th></th>
<th>H50RR</th>
<th></th>
<th></th>
<th>H25RR</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RR</td>
<td>H50</td>
<td>IND</td>
<td>RR</td>
<td>H25</td>
<td>IND</td>
</tr>
<tr>
<td>RR(±1/1000)</td>
<td>6</td>
<td>8</td>
<td></td>
<td>7</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>RR(±2/1000)</td>
<td>7</td>
<td>4</td>
<td></td>
<td>7</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>RR(±3/1000)</td>
<td>3</td>
<td>2</td>
<td></td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Did not switch</td>
<td>18 (53%)</td>
<td>38 (73%)</td>
<td></td>
<td>22 (55%)</td>
<td>35 (74%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>34</td>
<td>52</td>
<td>12</td>
<td>40</td>
<td>47</td>
<td>11</td>
</tr>
</tbody>
</table>
Reflections/Conclusions/Policy Context

- De facto ‘premium’ placed on End-of-Life
  
  *Mean health care expenditure high(est) in final 12/6/3 months of life*
  
  *But preferences appear heterogenous, but broadly in accord with NICE recommendations*

- Method facilitates an individual perspective (compatible with BCA)

What is terminal Illness? Is it “equivalent to” EOL? Relevant to NICE policy but to an extend unresolved.
Where we hope to go….

- Extend to other age cohorts
- Explore patient descriptors rather than standard descriptors of EOL
- Explore more aspects of the “Quantity/Quality Trade-Off across the lifecourse, EOL

Inform *ex ante* healthcare decisions with respect to End-of-Life and Terminal Illness.