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University of Technology, Sydney
City campus, Haymarket
PO Box 123 Broadway NSW 2007
Tel: +61 2 9514 4720
Fax: + 61 2 9514 4730
Email: mail@chere.uts.edu.au
www.chere.uts.edu.au

Men's preferences for treatment of early stage prostate cancer: Results from a discrete choice experiment

Madeleine King[1], Rosalie Viney[1], Ishrat Hossain[1], David Smith[2], Sandra Fowler[1], Elizabeth Savage[1], Bruce Armstrong[3]

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1. Centre for Health Economics Research and Evaluation
Faculty of Business
University of Technology, Sydney

2. Cancer Council NSW, Sydney, Australia.

3. Sydney Cancer Centre and University of Sydney, Australia.

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Abstract
Prostate cancer is the most common cancer in men in Australia; each year over 10,000 Australians are diagnosed with this disease. There are a number of treatment options for early stage prostate cancer (ESPC); radical prostatectomy, external beam radiotherapy, brachytherapy, hormonal therapy and combined therapy. Treatment can cause serious side-effects, including severe sexual and urinary dysfunction, bowel symptoms and fatigue. Furthermore, there is no evidence as yet to demonstrate that any of these treatments confers a survival gain over active surveillance (watchful waiting). While patient preferences should be important determinants in the type of treatment offered, little is known about patients' views of the relative tolerability of side effects and of the survival gains needed to justify these. To investigate this, a discrete choice experiment (DCE) was conducted in a sample of 357 men who had been treated for ESPC and 65 age-matched controls. The sample was stratified by treatment, with approximately equal numbers in each treatment group. The DCE included nine attributes: seven side-effects and two survival attributes (duration and uncertainty). An orthogonal fractional set of 108 scenarios from the full factorial was used to generate three versions of the questionnaire, with 18 scenarios per respondent. Multinomial logit (MNL) and mixed logit (MXL) models were estimated. A random intercept MXL model provided a significantly better fit to the data than the simple MNL model, and adding random coefficients for all attributes dramatically improved model fit. Each side-effect had a statistically significant mean effect on choice, as did survival duration. Most attributes had significant variance parameters, suggesting considerable heterogeneity among respondents in their preferences. To model this heterogeneity, we included men's health-related quality of life scores following treatment as covariates to see whether their preferences were influenced by their previous treatment experience. This study demonstrate how DCEs can be used to quantify the trade-offs patients make between side-effects and survival gains. The results provide useful insights for clinicians who manage patients with ESPC, highlighting the importance of patient preferences in treatment decisions.

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BACKGROUND

Some 680,000 men worldwide were diagnosed in 2002 with prostate cancer, which was second only to lung cancer (965,000 diagnosed), as the most common cancer in males[1]. In developed countries prostate cancer is now the most common male cancer, ahead of lung and bowel cancer, but is ranked fifth, behind lung, stomach, liver and bowel cancer in developing countries (Ferlay, Bray et al. 2004). Incidence increased dramatically in many developed countries during the 1980s and 1990s. For example, according to SEER data from cancer registries in the USA, age-adjusted incidence increased from 119 per 100,000 in 1986 to a peak of 237 in 1992 and then fell and stabilised at about 180 per 100,000 from 1999, a level still 50% more than 13 years earlier (Ries, Harkins et al. 2005). Survival from prostate cancer compares well with that from other cancers and has increased substantially in the last two decades in the USA (Ries, Harkins et al. 2005) and in most European countries (Coleman, Gatta et al. 2003) . The extent to which these increases in incidence and survival reflect earlier detection and more effective, newer treatments is unknown. Regardless of the reasons for the trends, the consequence is that more men are receiving treatment for early stage prostate cancer.

There are a number of treatment options for early stage prostate cancer; radical prostatectomy, radical external beam radiotherapy, brachytherapy (interstitial radiotherapy), hormonal therapy, combined therapy and "watchful waiting" (active surveillance but no active treatment). Each one has significant associated morbidity; the most important morbid consequences are incontinence, impotence and proctitis associated with prostatectomy and radiotherapy. Other complications include, major bleeding, bladder neck contraction, cystitis, urethral stricture, rectal incontinence or complications, urethral necrosis, perineal pain, hematuria and death. Furthermore, there is no evidence as yet to demonstrate that any of these treatments confers a survival gain over watchful waiting.

Patient preference should be an important factor in treatment decisions in early stage prostate cancer, since men will vary in the value they place on quality versus quantity of life, and on different aspects of quality of life, which in turn are influenced by treatment side-effects (National Health and Medical Research Council (NHMRC) 2003). Despite this, current management practices are primarily determined by patient age, patient fitness and tumour characteristics. Lack of knowledge and systematic study of patients' values and preferences in this context may explain the lack of inclusion of patient preferences in treatment decisions.

A number of studies have focussed on patient preferences in prostate cancer. The majority of these studies used Time Trade Off (TTO) and Standard Gamble (SG) to elicit preferences, and all investigated men's attitudes to side effects and health states associated with the management of prostate cancer. In terms of the trade off between quantity and quality of life, Bruner et al (2004) found that men were willing to trade very little, $\geq$ 1% of a 5yr life expectancy, for improved urinary and sexual function. Smith et al (2002) and Saigal et al (2001) also found that men placed more weight of survival time than quality of life. Many of these studies results focussed on sexual and urinary dysfunction, but when addition side effects such as pain or loss of physical strength were included, these were found to be as or more important (Chapman, Elstein et al. 1999;

Knight, Nathan et al. 2002; Krahn, Ritvo et al. 2003; Knight, Siston et al. 2004; Jenkins, Fallowfield et al. 2005; Stewart, Lenert et al. 2005). Sculpher et al (2004), the only paper found to have used a DCE, included eight attributes using two levels and found that on average participants were most willing to give up life expectancy to avoid limitations in physical energy and least willing to trade to avoid hot flushes.

The purpose of this study was to determine, from the patient's perspective, the relative tolerability of a wide range of side-effects of treatment for localized prostate cancer and the survival gains needed to make current treatment options worthwhile.

METHODS

Sample

We conducted a discrete choice experiment (DCE) in a random subsample of men enrolled in the NSW Prostate Cancer Outcomes Study (PCOS). PCOS is a population-wide investigation of quality of life, recurrence and survival in men aged less than 70 years who were newly diagnosed with prostate cancer in New South Wales (NSW), Australia, from September 2000 to October 2002. Participants were ascertained through the NSW Central Cancer Registry, a state-wide register of all cancers. The Cancer Council NSW Human Research Ethics Committee approved the study.

All PCOS participants have been undertaking annual telephone interviews measuring their quality of life, up to 5 years from diagnosis. Since the preferences of men may be influenced by their previous treatment experience, the DCE subsample was stratified by actual treatment; radical prostatectomy, external beam radiotherapy, brachytherapy (high and low dose), hormonal therapy, combined therapy, active surveillance (watchful waiting) and controls, giving seven 'treatment' groups with approximately equal numbers in each treatment group.

Experimental design and sample size

The total sample size was based on the degrees of freedom required to estimate all parameters of interest associated with the experimental design, which in turn was determined by the number of attributes and levels in the DCE. The DCE contained nine attributes, each with three levels, giving 3^9 possible scenarios. A fractional set of 108 scenarios from the full factorial provided sufficient degrees of freedom to estimate all main effects and two-way interactions. These could be allocated into questionnaires in two ways: 18 choice sets each containing a pair of scenarios (3 versions of this style of questionnaire would be required) or 9 choice sets each containing a trio of scenarios (4 versions of this style of questionnaire would be required); the two styles were tested in a pilot (described below), and the paired-scenario option was preferred. Thus a sample of 420 respondents was deemed sufficient, allowing for 20 respondents per treatment group per version; past experience suggests that 20-30 respondents per version are sufficient for adequate precision, while some authors recommend as few as six (Louviere, Hensher et al. 2000). Respondents were randomly sampled by strata and recruited by telephone by staff at the Cancer Council NSW before being sent a questionnaire and survey information pack in the post. They were then contacted by telephone by the same group

of interviewers from the Hunter Valley Research Foundation (HVRF) who have been contacting the men annually for other aspects of the PCOS data collection. Participants were randomly assigned to questionnaire version within each treatment strata.

DCE Attributes and Levels

The attributes were developed from the literature on health related quality of life in early stage prostate cancer, and in consultation with collaborating clinicians and consumers, and health services researchers who have experience with the estimation and interpretation of patient preference. The DCE included nine attributes (Table 1). Seven of these represented common side-effects: two aspects of sexual dysfunction (impotence and libido), two aspects of urinary dysfunction (leakage and blockage), bowel symptoms (problems with bowel movements and associated pain), fatigue and hormonal effects (hot flushes and moodiness). There were two survival attributes: duration (mean life expectancy) and uncertainty (range of life expectancy).

Each attribute was assigned three levels. For the side-effects, the three levels generally reflected degree of severity, from no problems through mild to severe. The two attributes for life expectancy were combined on the questionnaire to provide a range (either low, medium or high) around an average life expectancy given in years - this was presented graphically in the questionnaire. An example of a scenario is given in the appendix.

Questionnaire Pilot

Two questionnaire designs were tested: two alternatives in each of 18 scenarios ("pairs") versus three alternatives in each of 9 scenarios ("triples"). In the first phase of the pilot involved six volunteers from the Cancer Council NSW, all of whom had been treated for prostate cancer. This phase recorded respondents' preference for pairs or triples and time taken to complete each design. It also tested questionnaire wording and participants' comprehension of the task. In general, the material was understood, both designs were manageable (completion time ranged from 15-45 minutes) but the pair design was preferred. Suggestions regarding rewording were incorporated. As the questionnaire was to be sent to participants by post and then followed up with a telephone interview using Computer Assisted Telephone Interview (CATI) software, the script and CATI system was pilot tested in the second phase. Eligibility criteria and recruitment methods for this pilot were as for the main study, and 25 participants were recruited. The whole survey and data collection process worked well, feedback regarding the binding of the paper questionnaire was incorporated to make it easier for participants to turn the pages.

Econometric analysis

The statistical analysis of choice data relies on the random utility model (McFadden 1981) where each respondents faces a choice amongst J alternatives repeated under S scenarios or choice situations. The utility that individual i derives from alternative j in scenario s is composed of systematic and random components denoted by

$$(1) \qquad U_{isj} = V_{isj} + \varepsilon_{isj}$$

(2) $U_{isj} = X'_{isj}\beta + \varepsilon_{isj}$

where X_{isj} is a K x 1 vector of explanatory variables and β is a conformable vector of coefficients.

In choosing between 2 alternatives in each scenario, it is assumed that person i chooses the alternative that gives him the maximum utility. Then, the probability of choosing alternative 1 in scenario s is:

(3) $P_{is1} = P\,(U_{is1} > U_{is2})$

$= P\,[(V_{is1} + \varepsilon_{is1}) > (V_{is2} + \varepsilon_{is2})]$

$= P\,[(\varepsilon_{is2} - \varepsilon_{is1}) < (V_{is1} - V_{is2})]$

Assuming that the random components (ε_{isj}) are identically and independently distributed (IID) as extreme value, the probability of the choice can be estimated by the binary logit model:

(4) $$P_{is1} = \frac{\exp(X'_{is1}\beta)}{\exp(X'_{is1}\beta) + \exp(X'_{is2}\beta)}$$

The logit specification is widely used in health economics research to model discrete choice data. Simplicity of estimation and interpretation are among the main advantages of this model. However, there are some restrictive assumptions with this model that may be unrealistic in many situations.

In general, variability (heterogeneity) among the people is expected. Heterogeneity in preferences is a result of the inherent differences among individuals that can be attributed to their differences in tastes and decision making processes. Therefore, people with same observed characteristics may value and weight attributes of a product differently when making a decision. The binary logit specification can be generalized to account for this heterogeneity by allowing components of coefficients (β) to randomly vary over individuals but not over the repeated choices made by an individual by setting:

(3) $\beta_{ki} = \overline{\beta}_k + \mu_i \quad k = 1,\ldots,K$

where $\overline{\beta}_k$ is the mean parameter vector for the population and μ_i is the individual specific deviation from the mean. The μ_i are assumed to follow standard normal distributions, independent of each other and of the ε_{isj}. This specification introduces error correlation across choice situations, accounting for the dependence structure in unobserved utility among the repeated choices of an individual which comes from panel structure of the data. This would be expected, since the same unobserved factors affect a specific respondent, to a certain degree, over the repeated choices made by him. This

correlation is not perfect because of the presence of the independent extreme value terms ε_{isj}.

Advances in computer power and simulation based methods have made the resultant random parameter or mixed logit (MXL) model computationally feasible to estimate and popular in empirical work (Revelt, Train 1998; Train 1998; Geweke, Keane 2001; Hall, Fiebig et al. 2006; Lancsar, Hall et al. forthcoming). Estimation by maximum simulated likelihood (MSL) was undertaken using a program downloaded from Kenneth Train's website (Train 2004). All estimation results reported below were generated using 1000 Halton draws to simulate the likelihood functions to be maximized (Revelt, Train 1998; Brownstone, Train 1999; McFadden, Train 2000; Train 2003).

McFadden and Train (2000) provide strong theoretical support for MXL when they prove that any well-behaved random utility model can be approximated to any specified degree of accuracy by a MXL model. Unfortunately this existence result does not lessen the practical problem of deciding what particular specification should be chosen. Further, it is important to recognize that the richer stochastic structure that results from the random parameter framework of MXL is a by-product of the model specification and simple changes in the specification of the systematic component of (1) may have major implications for the resultant stochastic structure.

Welfare measurement and QALYs

In welfare economics the compensating variation (CV) gives an exact monetary measure of change in welfare. It is most commonly used to determine the welfare impacts of price changes.

Say the price of a good j falls from p^0 to p^1, income remains at the same level, *Y*, and utility falls rises from V^0 to V^1, where *V* is the systematic component of the utility function. CV is the reduction in income at the new price that would return an individual to the initial utility level.

The welfare impact of the price rise is given by the CV:

$$V\left(p^1, Y + CV\right) = V\left(p^0, Y\right) = V^0$$

If the price falls the individual is better off and CV is negative. If the price rises the individual is made worse off and the compensation is positive.

The CV can also be expressed as the change in the expenditure necessary to achieve the original utility level

$$CV = \begin{cases} e\left(p^1, u^0\right) - e\left(p^0, u^0\right) \\ \int_{p_0}^{p_1} e\left(p, u^0\right) dp \end{cases}$$

In health settings there are two major modifications to CV. The first is that choices are often mutually exclusive and discrete, for example treatment A or treatment B, so the probability of choosing different options is used rather than the quantity of a good. The second modification is that the focus is more often on quality changes, for example, changes in side effects associated with treatments than with price changes. In this case the CV is given by:

$$CV = \int_{p}^{\infty_1} \pi\left(p, u^0, q^1\right) dp - \int_{p}^{\infty_1} \pi\left(p, u^0, q^{01}\right) dp$$

If a logit specification is used to model the choice between J discrete and mutually exclusive alternatives, and if there is a quality change in alternative k, the CV can be written as

$$CV = \int_{V^0}^{V^1} \frac{e_k^V}{\sum_{j=1}^{J} e_j^V} dV$$

Or, more simply, for two mutually exclusive choices

$$CV = \frac{1}{\mu}\left[\ln\left(1 + e^{V^0}\right) - \left[\ln\left(1 + e^{V^1}\right)\right]\right]$$

where μ denotes the marginal utility of income. The use of μ converts utility changes into monetary units.

It is possible to use other indexes for welfare change. For example, in health settings, survival time may be used to indicate the value of changes in quality of treatments such as different frequency and severity of side effects.

Assume the utility function for the individual is defined over (chronic) health states and survival duration (see for example, Pliskin et al (1980). :

$$V = V(h, T)$$

The welfare impact of a change in health state, from h^0 to h^1, with no change in survival time, can be given by the change in survival time that would return the individual to the initial utility level, but with the new health state:

$$V\left(h^1, T + CV\right) = V\left(h^0, T\right) = V^0$$

If the change in health state is an improvement in quality of life, the individual is better off and CV is negative. For a decrement in quality of life the individual is made worse off and the compensation is positive.

Thus, if an individual with an initial health state with no symptoms or side-effects (and a given life expectancy) experiences a decrease in quality of life (represented as a combination of symptoms and side-effects) as a result of disease and/or treatment, it is

possible to determine the amount of additional survival time (increase in life expectancy) that would represent the same utility level as the initial health state. Survival time is the metric for measuring the welfare impacts of the change in health state, and in this case, μ denotes the marginal utility of survival time.

Thus, the CV can be used to provide a measure analogous to QALYs, given that a QALY is, by definition, a year of life in full health. If the QALY restrictions hold (Pliskin, Shepard et al. 1980; Bleichrodt, Wakker et al. 1997; Miyamoto, Wakker et al. 1998), this approach can be used to determine the QALY weight associated with any combination of symptoms and side-effects (defined as the ratio of survival duration without symptoms and side-effects that is equivalent in utility terms to the survival duration with the specified symptoms and side-effects).

RESULTS

Sample

1,715 men aged less than 70 were diagnosed with prostate cancer between September 2000 and December 2001 and identified by the NSW Cancer Registry as potentially eligible for PCOS. Consent was obtained for 1,067 (62%) of these men to participate in PCOS. A random sample of 510 of these men was invited to participate in the DCE substudy. 440 (86%) consented and 421 (83%) completed the DCE survey.

Estimated model

The estimated model is reported in Table 2. The intercept is the only random coefficient; this is a common way of capturing heterogeneity in panel data. This model allows for non-IID disturbances, but not for preference heterogeneity for attributes. This specification is also called the random effects model. In the next stage, we plan to estimate models with more parameters to be random to allow for preference heterogeneity for attributes. Some preliminary estimates from models with more random parameters have shown significant improvement in fit over the model with only intercept as random.

For the estimated models, the log likelihood function values for the binary logit model (all the parameters fixed) and the reported mixed model are -3941.79 and -3937.57, respectively. This shows that the addition of just one extra variance parameter to allow for random individual effects yields an improvement in fit over the logit model. While these models are nested, the hypothesis tests are non-standard because the parameter space is restricted under the alternative. In such situations the LR test statistic does not have the usual chi-square asymptotic distribution (Andrews 1998). In this case, the appropriate critical value will be smaller than the usual chi-square value. Therefore, the LR test statistic of 8.44 for the comparison of the logit and MXL models will lead to rejecting the logit in favor of the MXL model at every reasonable significance level.

Estimated coefficients for all attributes are statistically significant and generally have a sensible sign and magnitude. This implies that all the attributes were relevant to participants in choosing the treatment options for prostate cancer.

The coefficients for seven side effect attributes were estimated as dummy coded with the no side effect level in each attribute as the omitted level. For instance, in the case of the attribute fatigue (level of physical energy): "No change in your energy level" was the omitted level; "Some tiredness and loss of energy" was fatigue 1 (mild); "Severe tiredness and loss of energy" was fatigue 2 (severe). Similar patterns were used for the other side effect attributes. Therefore, the expectation was that the estimated coefficients would be negative and the coefficient for the severe level to be bigger in magnitude than that of mild level. The results confirm this for five attributes: leakage, blockage, bowel symptoms, fatigue and hormonal effects. For example, the estimates for leakage 1 and leakage 2 are -0.0719 and -0.7991, respectively. The implication is that when compared to a treatment with no leakage problem, the respondents are less likely to choose a treatment with mild leakage problem and the likelihood of choosing is even lower for the treatment with severe problem.

The coefficient estimates for the attributes related to sexual dysfunction, impotence and libido, do not have the same pattern as the other side effects. The severe levels for impotence and libido have the expected negative sign. However the mild level coefficients are positive suggesting that respondents would actually prefer mild sexual dysfunctions (eg, less sexual desire) compared to no problem. This may not be unexpected in this situation given the advanced age **(**average age is approximately 65**)** of the participants.

The magnitude or size of the coefficient estimates also give an indication of the relative tolerability of the side effect attributes. Referring to the estimates in table 2, leakage 2 has the largest estimate in size implying that severe problems with leaking urine is the side effect that affects the choice of treatment the most (least preferable side effect). Severe problems with bowel movements and associated pain also have a big impact, nearly as big as severe leakage problem. In terms of the least tolerable (preferable) side effects, severe level of blockage was next, then severe level of fatigue and hormonal effects. Severe level of impotence and libido were more tolerable than mild levels of hormonal effects and bowel symptoms.

One of the survival attributes is duration (average life expectancy), which was coded as continuous. As expected, the estimate for the attribute is positive, suggesting that respondents prefer more survival time and more likely to choose a treatment as the average life expectancy increases. Some caution is required in the interpretation of the remaining attribute, uncertainty (life expectancy range). The current specification of this attribute involves dummy coding with the low range as the omitted level. It seems from the positive estimates that the medium and high uncertainties are preferable compared to the low level. But it may be more appropriate to look into the effect of this attribute within the context of it's complex interaction with the duration attribute. The issue has not been addressed in the current setting and needs further investigation.

Welfare measurement and QALYS

Table 3 presents the compensating variations, measured in units of survival time for each of the side-effects of treatment. The CVs indicate the number of additional years of survival necessary to compensate for the side effect. CVs are presented for initial life expectancies of 4, 8 and 12 years. For example, for a man expecting 4 years of survival without symptoms, 2.4 additional years of survival are required to compensate for the utility impact of a treatment which results in the side-effect of severe problems with leaking urine (leakage 2). At 8 and 12 years of survival the CVs for this side-effect increase to 3.1 and 3.6 years respectively. Consistent across life-expectancies, the three side-effects requiring the greatest compensation are leakage 2, bowel symptoms 2, and blockage 2. Fatigue 2 and hormonal effects 2 impose smaller losses of utility, but are next in rank terms. Interestingly, impotence 2 and libido 2 require less compensation than hormonal effects 1 and bowel symptoms 1. For the less severe levels of side-effects, the rank ordering differs, with greater compensation required for hormonal effects 1, bowel symptoms 1 and fatigue 1 than for leakage 1. The negative compensation for impotence 1 and libido 1 may be explained by the initial health states of the respondents, because respondents may have already experienced or expected to experience symptoms equivalent or more severe to those represented by the milder levels of these side-effects in the experiment.

Table 4 presents the number of years with the side-effect which is equivalent to 4, 8 and 12 years respectively, that is, the implied time trade-off. Under the assumption that the QALY model holds, these values can be used to calculate the implied QALY weights for each health state. For example, the implied QALY weight for a health state in which an individual experiences severe problems with urine blockage is 0.68 at 4 years of life expectancy. From Table 4 it can be seen that the QALY weights of the health states depend on the survival duration, which is not consistent with the way that QALY weights are used in economic evaluation. It also suggests that it may be important in experiments designed to elicit QALY weights, to allow for interactions between health state and survival duration.

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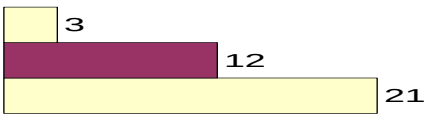
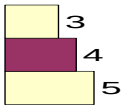
Appendix - Example Scenarios

Option A ***With this treatment option you will experience the following:***	**Option B** ***With this treatment option you will experience the following:***
Never able to achieve an erection when you want one	No problems achieving an erection when you want one
Less sexual desire	Less sexual desire
Severe problems with leaking urine (no urinary control whatsoever)	Occasional problems with leaking urine
Some problems with urine blockage (have a weak urine stream but get some relief or comfort afterwards)	Some problems with urine blockage (have a weak urine stream but get some relief or comfort afterwards)
No bowel problems	Occasional loose bowel movements with discomfort/pain
Severe tiredness and loss of energy	Some tiredness and loss of energy
Severe hot flushes and moodiness	No hot flushes or moodiness
*Most people who have this option live between **3** and **21** years, but on average for* **12 years** 	*Most people who have this option live between **3** and **5** years, but on average for* **4 years** 

Would you choose option A or B?

✓

Option A…….. **OR** **Option B……..**

Table 1: Attributes and Levels

1. Impotence		
Quality and frequency of erection	0	No problems achieving an erection when you want one
	1	Some problems achieving an erection when you want one
	2	Never able to achieve an erection when you want one
2. Libido		
Loss of sexual desire:	0	No change in sexual desire
	1	Less sexual desire
	2	Complete loss of sexual desire
3. Leakage		
Problems with urinating	0	No problems with leaking urine
	1	Occasional problems with leaking urine
	2	Severe problems with leaking urine (no urinary control whatsoever)
4. Blockage		
Problems with urinating	0	No problems with urine blockage
	1	Some problems with urine blockage (have a weak urine stream but get some relief or comfort afterwards)
	2	Severe problems with urine blockage (continually feeling the need to urinate but passing very little with no relief afterwards)
5. Bowel symptoms		
Problems with bowel movements and associated pain	0	No bowel problems
	1	Occasional loose bowel movements with discomfort/pain
	2	Very frequent loose bowel movements with discomfort/pain and leakage
6. Fatigue		
Level of physical energy	0	No change in your energy level
	1	Some tiredness and loss of energy
	2	Severe tiredness and loss of energy
7. Hormonal effects		
Hormones	0	No hot flushes or moodiness
	1	Mild hot flushes and moodiness
	2	Severe hot flushes and moodiness
8. Life expectancy		
	0	12 years
	1	8 years
	2	4 years
9. Life expectancy range		
Life expectancy range	0	*Most people who have this option live between "X & Y" years, but on average for "Attribute 8"*
Low 25% Medium 50% High 75%		X and Y range (in brackets): if attribute 8 = 2 (3yrs – 5yrs), 1 (6yrs – 10yrs), 0 (9yrs – 15yrs)
	1	*Most people who have this option live between "X & Y" years, but on average for "Attribute 8"*
		X and Y range (in brackets): if attribute 8 = 2 (2yrs – 6yrs), 1 (4yrs – 12yrs), 0 (6yrs – 18 yrs)
	2	*Most people who have this option live between "X & Y" years, but on average for "Attribute 8"*
		X and Y range (in brackets): if attribute 8 = 2 (1yr – 7yrs), 1 (2yrs – 14yrs), 0 (3yrs – 21yrs)

Table 2: The model estimates

Log-Likelihood Function value: -3937.56610217

		Estimates	St.errors	p-value
Intercept	mean	-0.1387	0.0304	0.0000
	st.dev	0.2693	0.0605	0.0000
Impotence 1	dummy	0.1414	0.0418	0.0007
Impotence 2	dummy	-0.1340	0.0514	0.0091
Libido 1	dummy	0.1183	0.0432	0.0062
Libido 2	dummy	-0.0970	0.0411	0.0182
Leakage 1	dummy	-0.0719	0.0385	0.0619
Leakage 2	dummy	-0.7991	0.0493	0.0000
Blockage 1	dummy	-0.1332	0.0391	0.0007
Blockage 2	dummy	-0.6146	0.0446	0.0000
Bowel symptoms 1	dummy	-0.1908	0.0366	0.0000
Bowel symptoms 2	dummy	-0.7299	0.0514	0.0000
Fatigue 1	dummy	-0.0945	0.0322	0.0034
Fatigue 2	dummy	-0.3699	0.0363	0.0000
Hormonal effects 1	dummy	-0.2415	0.0362	0.0000
Hormonal effects 2	dummy	-0.3626	0.0482	0.0000
Life expectancy	**continuous**	0.1845	0.0098	0.0000
Life expectancy range 1	dummy	0.1049	0.0394	0.0077
Life expectancy range 2	dummy	0.0708	0.0388	0.0682

Table 3: Compensating variations, measured in units of survival time for each of the side-effects of treatment.

	Life expectancy		
	4 years	8 years	12 years
Impotence 1	-0.507	-0.616	-0.686
Impotence 2	0.457	0.567	0.640
Libido 1	-0.422	-0.514	-0.573
Libido 2	0.333	0.412	0.464
Leakage 1	0.248	0.307	0.345
Leakage 2	2.378	3.102	3.638
Blockage 1	0.455	0.564	0.637
Blockage 2	1.905	2.450	2.841
Bowel symptoms 1	0.645	0.802	0.909
Bowel symptoms 2	2.206	2.863	3.343
Fatigue 1	0.325	0.402	0.453
Fatigue 2	1.207	1.522	1.741
Hormonal effects 1	0.808	1.010	1.146
Hormonal effects 2	1.185	1.494	1.707

Table 4: The number of years with the side-effect which is equivalent to 4, 8 and 12 years respectively; the implied time trade-off and QALY weights

	Implied TTO values			Implied QALY weights		
	4 years	8 years	12 years	4 years	8 years	12 years
Impotence 1	3.493	7.384	11.314	1.145	1.083	1.061
Impotence 2	4.457	8.567	12.640	0.897	0.934	0.949
Libido 1	3.578	7.486	11.427	1.118	1.069	1.050
Libido 2	4.333	8.412	12.464	0.923	0.951	0.963
Leakage 1	4.248	8.307	12.345	0.942	0.963	0.972
Leakage 2	6.378	11.102	15.638	0.627	0.721	0.767
Blockage 1	4.455	8.564	12.637	0.898	0.934	0.950
Blockage 2	5.905	10.450	14.841	0.677	0.766	0.809
Bowel symptoms 1	4.645	8.802	12.909	0.861	0.909	0.930
Bowel symptoms 2	6.206	10.863	15.343	0.645	0.736	0.782
Fatigue 1	4.325	8.402	12.453	0.925	0.952	0.964
Fatigue 2	5.207	9.522	13.741	0.768	0.840	0.873
Hormonal effects 1	4.808	9.010	13.146	0.832	0.888	0.913
Hormonal effects 2	5.185	9.494	13.707	0.772	0.843	0.875