



How important is Severity for the Evaluation of Health Services

New evidence using the
Relative Social Willingness to Pay Instrument

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ABSTRACT

The importance of severity as an independent determinant of the priority people would assign to a health program has been confirmed in a large number of studies. The majority of these have employed the Person Trade-off (PTO) methodology in order to achieve a social perspective. The present paper investigates the importance of severity using an alternative instrument, the Relative Social Willingness to Pay (RS-WTP) which, like the PTO, embodies a social perspective. However in other respects the two instruments differ significantly. Consequently, the use of RS-WTP represents a test of the robustness of severity results: their sensitivity to the framing of questions regarding social preferences.

The paper outlines methods and presents results from a trial application of the methods.

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How Important is Severity? New Evidence from the Relative Social Willingness to Pay Instrument

1 Introduction

The ‘severity hypothesis’ is that the priority people would assign to a health program rises with the severity per se of the initial health state, ie a health intervention which increases a patient’s utility by a fixed amount will be valued more highly when the initial health state is more severe. The hypothesis is important for health policy as the prevailing methodology for evaluating health services – cost utility analysis (CUA) – ignores severity per se and assigns priority according to the cost per additional QALY, where additional QALYs take account of the increase in utility and the duration of the improvement but not the initial severity of the condition.

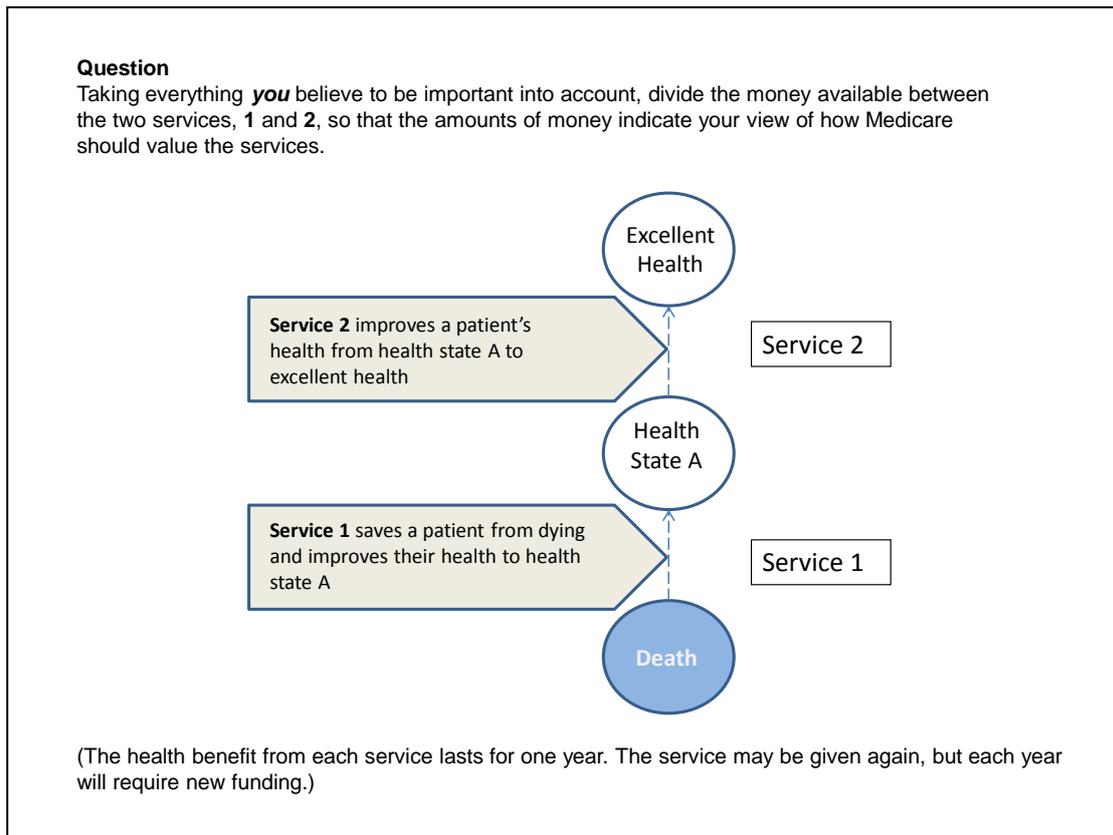
A review of the literature by Shah (2009) identified 66 reports which had considered the severity hypothesis. The review concluded that ‘on the whole’ the hypothesis is supported. However ‘there remain unresolved issues regarding the elicitation and interpretation of preferences’ (p 77). There was no attempt to draw quantitative conclusions concerning the strength of the severity effect from the review. In contrast, Nord and Johansen (2014a, b) first extended the Shah review, selected 17 studies with useable results, and conducted a quantitative synthesis to provide a range of values for the size of the severity effect. These proved to vary significantly between studies. Nevertheless, the authors provide indicative results for the relationship between incremental utility and incremental social value. These are compared with the present results in Section 3. Nord and Johansen had an important caveat to their results. This is that their synthesis ‘cannot alone describe the structure of concern for severity over the whole 0-1.0 range of utility’ (p 7). The incremental value-utility relationship analysed by Nord and Johansen commences with a health state where the patient faces death: utility = 0.00. A disproportionate social valuation of incremental utility for an individual in this health state necessarily implies diminishing incremental social value for subsequent increments of utility. However the social value associated with incremental utilities of a second patient in a severe but non-lethal health state may differ from those associated with a lethal health state.

The Relative Social Willingness to Pay (RS-WTP)

The RS-WTP was developed as an alternative to the PTO as an instrument for measuring the strength of preference for health improvement from a social perspective. Like the PTO, values are placed upon services which move people from one health state to another. Also like the PTO it asks respondents to evaluate services on behalf of society. Unlike the PTO it uses the dollar as a measurement metric, but unlike the conventional willingness to pay (WTP) technique it asks respondents to allocate a fixed budget between two services. The first service saves the person from death but leaves them in a defined health state. The second service takes a person from

that health state to best health, as defined on the scale (see Box 1). The opportunity cost of funds spent on one program is therefore the reduction in funds spent on the second program. An index number for the value of the improvement may be obtained by dividing the amount allocated to a program by the total budget. For example if \$25,000 and \$15,000 were allocated to service 1 and service 2 from a budget of \$40,000 the relative value of service 1 and service 2 would be assessed as $25/40 = 0.625$ and $15/40 = 0.375$ respectively. As the indices sum to 1.00 they represent the value of the service on a 0.00-1.00, death-best health scale.

Box 1 Relative Social Willingness to Pay instrument



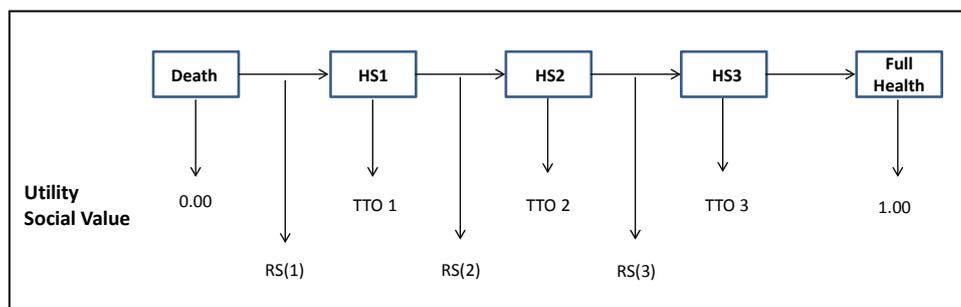
Properties of the RS-WTP and a comparison with the TTO and PTO are given in Richardson et al. (2013). The instrument test-retest reliability, as judged by the intra class correlation (ICC) is high (ICC of 0.96 and 0.83 between an initial online survey, a two week follow-up online survey and a subsequent interview). The Pearson correlation between the interview and PTO was high (0.93) but the lower ICC of 0.87 is indicative of absolute differences in values. Mean scores from the RS-WTP interview were 14 percent lower (0.56 versus 0.65) and regression analyses indicated that PTO scores rose more rapidly than the RS-WTP as health improved. The differences are significant and indicate that the framing of the priority question in the RS-WTP might, potentially, alter conclusions with respect to the severity hypothesis. The present study therefore represents a test of how robust the hypothesis is to framing effects.

2 Methods

A convenience sample of 98 individuals was recruited who agreed to complete a three stage survey. The first two stages consisted of the completion of an online survey and two weeks later the repetition of the same survey. The third stage data which are used in the current study were obtained from a face-to-face interview at Monash University during which the survey and additional questions were administered by a trained interviewer. Participants were paid \$30 upon completion. The protocol for the survey was approved by the Monash University Human Research Ethics Committee (MUHREC approval no 2004/750).

Data: The design for the data collection is illustrated in Box 2. Items from the AQL-8D were used to construct a sequence of three health states, HS1, HS2, HS3, where HS2 and HS3 substituted better for worse elements of the health state so that the sequence necessarily represented progressively better health states. TTO utilities were elicited for each state and the RS-WTP instrument was used to allocate a budget between programs which moved individuals between the health states, ie from death to HS1; HS1 to HS2; HS2 to HS3 and HS3 to full health.

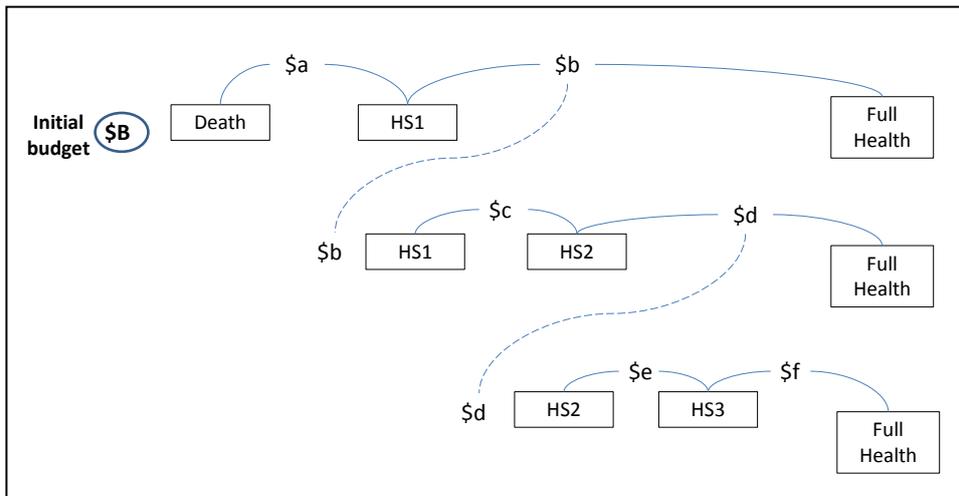
Box 2 Data collected



The method used to achieve this is illustrated in Box 3. An initial budget \$B was allocated between two services. The first shifted an individual from imminent death to HS1. The second shifted an individual from HS1 to full health. In Box 3 the amounts allocated to the two services are \$a and \$b where $\$a + \$b = \$B$, the initial budget. In the second stage the amount \$b was used as the total budget to be allocated between two new services, the first improving health from HS1 to HS2 and the second from HS2 to full health. As shown in Box 3 the two services receive an allocation of \$c and \$d respectively where $\$c + \$d = \$b$. In the third and final stage \$d became the total budget to be allocated between two services which respectively shifted the patient from HS2 to HS3 and from HS3 to full health. At the end of the three stage procedure the results were displayed and respondents were permitted to adjust their decisions.

This 'three health state design' was used with six sets of health states. In total, therefore, 18 health states were employed. They are reproduced in Appendix 1. Each respondent completed two sets of three health states, ie six health states per person respectively. Each set of three health states produced 9 possible improvements which might be achieved by health services.

Box 3 Assigning the budget to incremental health improvements



Analyses: The key assumption in the analysis was that the value of a service is equal to the share of the budget allocated to each of the incremental improvements which constitute the service. For example, a service which improved a person from imminent death to H3 was valued by summing the values of the improvements from death to H1, H1 to H2 and H2 to H3. This permitted the data to model the value of the nine services shown in Box 4. As two sets of three health states were evaluated by each respondent this resulted in the 18 ‘services’ per respondent.

Box 4 Services modelled by ‘Step RS-WTP’

1. Death – HS1	4. HS1 – HS2	7. HS2 – HS3
2. Death – HS2	5. HS1 – HS3	8. HS2 – Full health
3. Death – HS3	6. HS1 – Full health	9. HS3 – Full health

The severity hypothesis was tested using equation 1. The RS-WTP valuation of services, R , was regressed upon TT , which is the difference between the TTO health state valuations, and upon the TTO value of the initial, poorer health state which therefore measured the severity, S , of the initial health state. Death may be perceived as more than a particularly severe health state. To test this possibility a dummy variable, D , was included in regressions to indicate when the service saved a patient’s life. Linear and double log regressions were employed.

$$R = f[TT, S, D] \quad \dots \text{equation 1}$$

where $R = RSWTP (HS_i) - RSWTP (HS_j)$

$$TT = TTO (HS_i) - TTO (HS_j)$$

$$D = 1 \text{ if } TTO_j = \text{death}$$

$$= 0 \text{ otherwise}$$

3 Results

Data: The composition of the sample and the sequencing of questions are summarised in Table 1. The convenience sample of 94 persons was almost equally divided by gender. Each respondent completed the survey which resulted in $18 \times 94 = 1692$ data points. Of these, one third or 564 were for an RS-WTP which involved a life saving service; two thirds or 1124 were for service which improved health from an intermediate health state. Mean values for the 18 health states are reported in Table 2. The distribution of the 1692 'services' by initial severity and the increase in the utility (TT) is given in Table 3 and the corresponding mean value of R in Table 4.

Table 1 Data Collection

Order of presentation of health states (H _i)	Respondent n			Observations per person (n x 18)
	Male	Female	Total	
(H1, H2, H3)(H4, H5 H6)	32	33	65	1170
(H7, H8, H9)(H10, H11, H12)	9	11	20	360
(H13, H14, H15)(H16, H17, H18)	3	6	9	162
Total	44	50	94	1692

Table 2 Summary statistics by health state⁽¹⁾

	Mean		se		Max		Min		n ⁽³⁾
	RS-WTP ⁽²⁾ (Interview)	TTO	RSWTP (Interview)	TTO	RSWTP (Interview)	TTO	RS-WTP ⁽²⁾ (Interview)	TTO	
HS1	0.41	0.56	0.03	0.03	1.00	0.90	0.00	0.10	65
HS2	0.65	0.71	0.02	0.02	1.00	0.99	0.25	0.25	65
HS3	0.84	0.87	0.02	0.02	1.00	1.00	0.25	0.40	65
HS4	0.36	0.46	0.03	0.03	1.00	0.90	0.00	0.00	65
HS5	0.58	0.62	0.03	0.02	1.00	1.00	0.00	0.10	65
HS6	0.72	0.73	0.03	0.02	1.00	1.00	0.00	0.20	65
HS7	0.41	0.43	0.04	0.06	0.75	0.80	0.00	0.01	20
HS8	0.72	0.61	0.03	0.06	0.90	0.90	0.50	0.10	20
HS9	0.91	0.86	0.02	0.03	1.00	1.00	0.75	0.50	20
HS10	0.38	0.43	0.04	0.06	0.75	0.80	0.13	0.01	20
HS11	0.64	0.57	0.03	0.06	0.88	0.92	0.38	0.01	20
HS12	0.83	0.79	0.04	0.04	0.75	1.00	0.13	0.50	20
HS13	0.44	0.45	0.04	0.11	0.63	0.95	0.25	0.01	9
HS14	0.63	0.61	0.04	0.08	0.81	0.95	0.38	0.20	9
HS15	0.86	0.88	0.02	0.05	0.95	1.00	0.75	0.60	9
HS16	0.43	0.38	0.05	0.09	0.63	0.85	0.25	0.01	9
HS17	0.71	0.53	0.04	0.09	0.88	0.90	0.50	0.01	9
HS18	0.90	0.85	0.05	0.03	0.63	0.98	0.25	0.70	9

(1) Health states are described in Appendix 2

(2) RS-WTP = Budget allocated to service/total budget

(3) n = number of observations of a health state

Table 3 Distribution of 'services by initial severity (S) incremental utility (TT)

TT \ Severity Range		0.0-1.0	0.11-0.2	0.21-0.4	0.41-0.6	0.61-0.8	0.8-0.99	1.00
	n	n						
1.00	188	4	5	18	40	76	36	9 ⁽¹⁾
0.8-0.99	511	32	27	58	94	122	100	32
0.6-0.79	154	11	18	30	10	47		
0.4-0.59	285	33	33	60	137			
0.2-0.39	365	75	56	194				
0.0-0.19	179	195	130					
0	10	10						
Total	1692	360	269	360	281	245	136	41

(1) TT of 1.0 was observed when individuals assigned the full budget to the move from 0.0 – HS3 and no budget for the move HS3-1.00.

Table 4 Mean observed incremental social value (R) by initial severity (S) and incremental utility (TT)

TT \ Severity Range	0.0-1.0	0.11-0.2	0.21-0.4	0.41-0.6	0.61-0.8	0.8-0.99	1.00
	Mean R (actual)						
1.00			0.54	0.67	0.66	0.78	0.80
0.99-0.81	0.64*	0.68*	0.38	0.47	0.59	0.72	0.70
0.8-0.61	0.31	0.31*	0.39	0.40	0.49		
0.6-0.41	0.25	0.24	0.38	0.42			
0.4-0.21	0.19	0.27	0.35				
0.-0.2	0.20	0.30					

*n ≤ 5 (see Table 3)

Regression Results: Table 5 reports linear and double log regressions. Linear regressions achieve a high R². They are consistent with the existence of a significant severity effect. However, with maximum severity (S=1) and the maximum incremental utility (TT=1) the predicted incremental value (R) falls short of the necessarily correct value of R=1 by 0.21 in both equations (1) and (2). Each of the log regressions (3)-(5) meets this necessary condition. Coefficients all imply a value-utility (R-TT) function which is concave from below (b<1.00). The inclusion of the dummy variable for a service preventing death (D) in regression 5 results in a perverse negative sign indicating an interaction with the severity variable S. The preferred result was therefore regression 4 in which both T and S are highly significant. Removing the logarithm the regression becomes equation 2.

$$R = TT^{0.52} S^{0.3} \quad \dots \text{equation 2}$$

Equation 2 was used to predict values for different combinations of T and S; that is for the social value of services which increase utility by different amounts and from different initial levels of severity. Results which are reported in Table 6 are used to calculate the social value of an increment of utility (TT) of 0.1 in Table 7. The numbers in each row of Table 7 are therefore the difference between neighbouring numbers in Table 6.

Equation 2 was employed to generate predicted values which corresponded with each of the 1692 observations. These were used to obtain average predicted values which corresponded with the actual value shown in Table 4. Figure 1 plots predicted against actual values. The corresponding regression equation achieves high explanatory power. However the b coefficient of 1.45 indicates that equation 2 over predicts incremental changes in value.

Table 5 Regression Coefficients

Dependent Variable \ Independent variable	(1)	(2)	(3)	(4)	(5)
	R	R	Log R	Log R	Log R
TT	0.50 (19.1)	0.50 (19.0)			
S	0.29 (15.4)	0.29 (13.2)			
Log TT			0.68 (2.30)	0.52 (23.1)	0.43 (18.4)
Log S				0.30 (9.0)	0.40 (11.9)
D		-0.01 (ns)			-0.16 (9.9)
R ² (adj)	0.81	0.85	0.63	0.65	0.66
	1692	1692	1692	1692	1692

Figure 1 Actual vs predicted values (average data) n=27

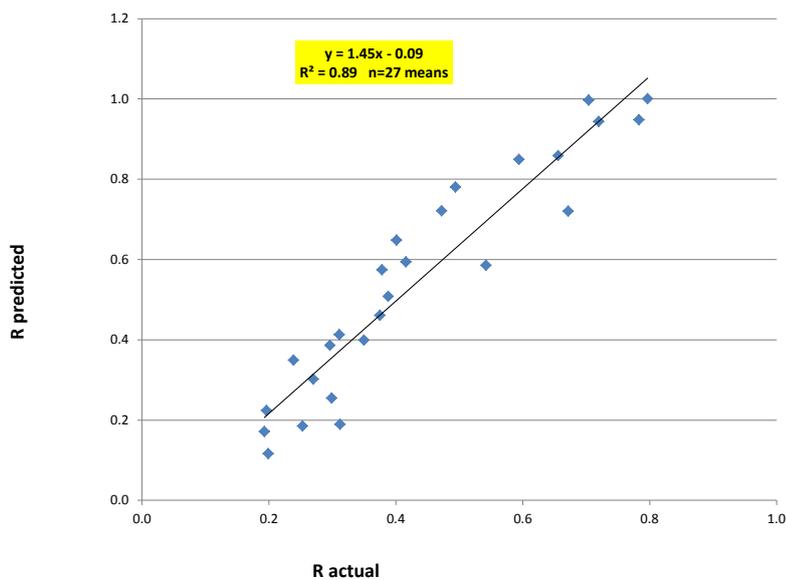


Table 6 Predicted Incremental Relative Social Value, V_i , by Initial Severity, S , and Incremental Utility, U_i-U_j ⁽¹⁾

$S=U_j$ \ U_i-U_j ⁽²⁾	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	Implied value U_j ⁽⁴⁾
	Relative Social Value (V) predicted										
1.00 ⁽³⁾	0.301	0.432	0.533	0.619	0.695	0.764	0.828	0.888	0.944	0.997	0.00
0.95	0.297	0.426	0.527	0.611	0.687	0.755	0.818	0.877	0.932		
0.9	0.293	0.420	0.518	0.602	0.676	0.743	0.805	0.863	0.917		0.83
0.8	0.282	0.405	0.500	0.581	0.652	0.717	0.777	0.833			0.167
0.7	0.271	0.389	0.480	0.558	0.627	0.689	0.746				0.254
0.6	0.259	0.372	0.459	0.533	0.598	0.658					0.342
0.5	0.245	0.352	0.434	0.504	0.566						0.434
0.4	0.229	0.329	0.406	0.472							0.528
0.3	0.210	0.302	0.373								0.627
0.2	0.186	0.267									0.733
0.1	0.151										0.869
S_{max} / S_{min}	1.989	1.616	1.431	1.312	1.227	1.162	1.110	1.066	1.029		

(1) $V=(U_i-U_j)^{0.52} S^{0.3}$

(2) The maximum increase in utility (T) is, by construction, equal to 1-S.

(3) Computed as $S=0.99$ (in the double log regression)

(4) The maximum incremental utility (TT) in each row will result in full health which corresponds with a value $V=1.00$. Consequently the implied value V_j^* of the health state, U_j , is the difference between 1.00 and the maximum social value obtained from incremental utility (U_i-U_j), ie $V_j^*=1-\text{Max incremental value}$.

Table 7 Incremental value with utility increments of 0.1

S	Incremental									
	0.0-0.1	0.1-0.2	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9	0.9-1.0
1.00	0.301	0.131	0.101	0.086	0.076	0.069	0.064	0.060	0.056	0.053
0.9	0.293	0.127	0.098	0.084	0.074	0.067	0.062	0.058	0.054	
0.8	0.282	0.123	0.095	0.081	0.071	0.065	0.060	0.056		
0.7	0.271	0.118	0.091	0.078	0.069	0.062	0.057			
0.6	0.259	0.112	0.087	0.074	0.066	0.059				
0.5	0.245	0.106	0.083	0.070	0.062					
0.4	0.229	0.100	0.077	0.066						
0.3	0.210	0.091	0.071							
0.2	0.186	0.081								
0.1	0.151									

4 Discussion

The inclusion of severity has a significant effect upon the implied allocation of resources which would be selected by our survey respondents. A service which saves a person's life and returned them to full health would – like conventional cost utility analyses – receive an importance weight of 1.00 (line 1 Table 6). However if the service only returned a person to U=0.1 the importance weight would be 0.301, not 0.1; that is, the severity effect increases the importance of the service by a factor of 3. This necessarily implies a diminution in the importance of incremental utility following life saving; that is, as utility increases, value increases at a decreasing rate.

Each row in Table 7 indicates the diminution in marginal value as utility rises *commencing with the same level of severity*. Line 2 therefore indicates the diminution for a patient commencing with the maximum severity of S=0.9. Line 3 represents the diminution for a patient commencing with S=0.8. The rates of diminution differ. As the initial severity falls (lower rows in Table 7) the magnitude of incremental value falls. Therefore incremental value falls both with declining initial severity and with increasing utility from any initial level of severity.

However the two causes of the diminution of marginal value are not symmetrical. The maximum increase in utility (1.00) in row 1 necessarily corresponds with a social value from cumulative increases in utility of 1.00. In contrast, cumulative increases in value commencing with different levels of severity are not constrained in this way. From Table 6 an increase in utility of 0.2 has a value of 0.43 when S=1.0; a value of 0.389 when S=0.7; 0.372 when S=0.6; 0.329 when S=0.4 and 0.267 when S=0.2. If five separate individuals received these increments the cumulative increase in utility would be 1.0 but the cumulative increase in value would be 1.79.

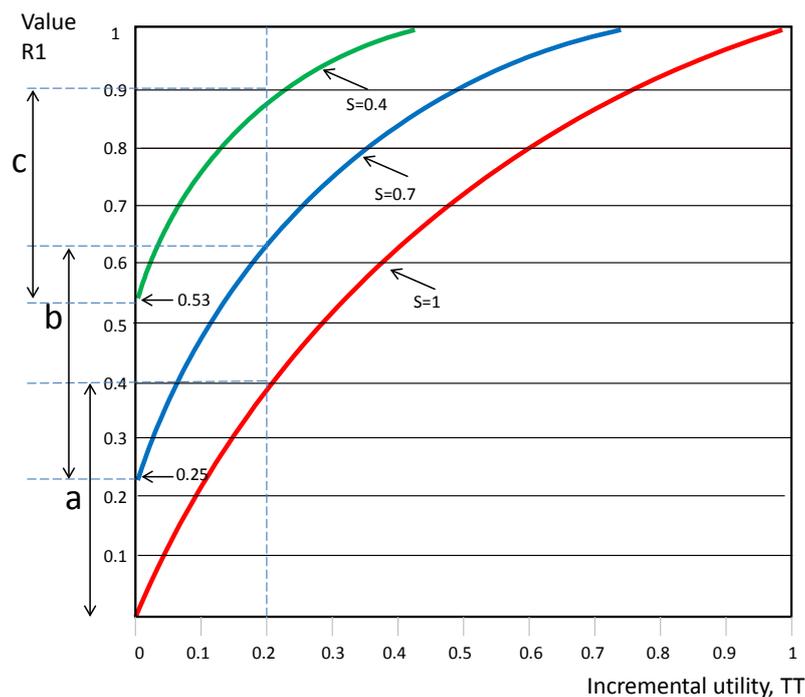
This result is not inconsistent if five different individuals are affected. As value is subject to decreasing returns as utility rises, allocating the budget to initial improvements where severity effects are greatest achieves disproportionate value. However the results are paradoxical if they applied to a single individual, ie if an individual who was initially moved from S=1.0 to S=0.7 and subsequently to S=0.6, 0.4, 0.2, in five separately assessed steps.

The problem is illustrated in Figure 2 which plots the relationship between incremental utility and value for three initial levels of severity, S=1.0, 0.7 and 0.4. If a single individual is considered who is saved from death and receives increments of utility until she achieves full health the increase in value would follow the lower concave line and the social valuation of cumulative increments of

utility would equal 1.00. In contrast, if three individuals received increments of $U=0.2$, the sum of the incremental utilities would be 0.6. However in Figure 2 the incremental value obtained would equal $a+b+c$ where these values are not constrained. From Table 6 the cumulative value for the three individuals would be 1.15 from initial severity levels of 1.0, 0.7 and 0.4 (0.432+0.389+0.329).

Figure 2 Incremental utility and cumulative value, severity

Severity = 1.0, 0.7, 0.4



The result reflects the fact that the relationship between incremental utility and value is constrained for any given level of severity but unconstrained when severity varies. When allocating a budget there is no constraint upon the importance placed upon initial levels of severity. Individuals evaluating different services for different people may place disproportionate importance upon initial improvement at all levels of severity, such that there is a cumulative value which exceeds the value which would be obtained from the same change in utility obtained from a single individual.

Data in Table 7 provide a new focus upon an earlier exchange in the literature. In this Østerdal (2003) provided an example, reproduced in Table 8, to illustrate an apparent incongruity in the use of severity weights proposed by Nord et al. (1999). In this, Nord et al. contrasted two programs. Program 1 shifted one patient from $U=0$ (facing death) to $U=0.5$ and a second patient from $U=0.5$ to full health, $U=1.00$. The second program shifted one patient from $U=0$ (facing death) to full health ($U=1.00$) and left the second patient unchanged at 0.5. With the weights employed in the Nord et al. study the social values associated with the two programs were 0.95 and 1.00 respectively. Commenting on the apparent superiority of program 2 Østerdal states that 'since the final outcomes of the two programs are identical in terms of patient utility, except for a permutation of individuals, it seems difficult to find a justification for such a priority' (p 248) (italic text added). In their reply Nord et al. (2003) explain that 'the result is driven by the fact that the

entire health improvement for the single patient (*program 2*) is multiplied by the very high severity weight which applies to life saving treatments. In the alternative program (*program 1*) only one of the two patient's utility gain receives this weight and the other patient's utility gain receives a lower weight. The *average weight* in the program is therefore less and the program will be ranked below the single patient program' (p 252, italics added).

Table 8 A possible inconsistency

	Change in utility		Final U (P1) (P2)		Social Value (Osterdal/Nord) (Nord & Johansen 2014b)	Table 6		Social Value (addition of V)
	Person 1 (P1)	Person 2 (P2)				V values (P1)	(P2)	
Program 1	0 → 0.5	0.5 → 1.0	0.5	1.0	.95	0.695	0.566	1.26
Program 2	0 → 1.0	0.5 → 0.5	1.0	0.5	1.0	1.0	0.0	1.00

This latter argument, like the initial illustration, is based upon a formula, accepted by both parties in the interchange, that the effect of severity may be incorporated by multiplying the *unchanging severity weight* derived from the initial level of severity by the full value of incremental utility. The present results, summarised in the final two columns of Table 8 imply the more complex interaction described above with a diminution in the social value of utility which varies with both of the initial severity and with the size of the utility increment. The effects are not symmetrical. The latter effect – the diminution as incremental utility increases (a movement along a row in Table 6 or 7) is greater than the diminution of the severity effect as severity decreases (a movement down a column). Consequently the values for the two programs differ but it is program 1 and not program 2 which generates the greater social value as program 2 is subject to greater diminution in the value of utility.

In the more recent publication cited in the introduction, Nord and Johansen (2014b) illustrate the results from their quantitative synthesis for two possible parameters which determine the relationship between incremental utility and social value. These are reproduced in Table 9 along with the results from the first line of Table 7. As the two sets of results were derived with very dissimilar methods their similarity is striking. However the present results, reproduced in the table, are for increments of utility which have commenced, as with the Nord Johansen data, with maximum severity. Because of the interaction of diminishing marginal value and diminishing severity noted above the similarity is limited to this special case. To our knowledge there is no comparable data in the literature for incremental social value commencing with lower levels of severity.

The policy implication of the asymmetry in the diminution of utility and the resulting differences in the relationship between utility and value are unclear. One option would be to disregard it. A single individual receiving a service shifts from left to right across a given row and there is no inconsistency in the diminution of marginal valuations as utility rises. If a person remains at a low level of utility for a prolonged period, it may be acceptable to regard them as a new case and evaluate subsequent improvement by moving their case to a new row rather than across the row corresponding with the initial, historical severity.

Table 9 Comparison of Results with Nord and Johansen (2014)

Initial Utility (Severity)	Incremental utility	Incremental social value Nord and Johansen ⁽¹⁾		Incremental social value
		n=2	n=4	Row 1 Table 7
0.0	0.1	0.25	0.36	0.30
0.1	0.1	0.18	0.19	0.13
0.2	0.1	0.13	0.13	0.10
0.3	0.1	0.11	0.09	0.09
0.4	0.1	0.08	0.06	0.08
0.5	0.1	0.07	0.05	0.07
0.6	0.1	0.06	0.04	0.06
0.7	0.1	0.05	0.03	0.06
0.8	0.1	0.04	0.03	0.06
0.9	0.1	0.04	0.02	0.05

(1) Social value in the Nord and Johansen study is determined by a formula in which 'n' is a key parameter.

An alternative solution would be to impose consistency upon the data, for example by replacing the incremental value in the columns of Table 7 with the incremental values derived (and interpolated) from the first row. Incremental improvements between levels of severity would then be consistent. However this solution would not correspond with the values implied by respondents in the present study.

The number of respondents in the study was small and based upon a convenience sample responding to a limited number of health states. An additional methodological reservation is that the RS-WTP is a new instrument. While it is theoretically appealing and has been successfully tested for reliability and validity, these tests are limited and the instrument must be considered experimental. However the most important caveat in interpreting these and other results consistent with the severity hypothesis is that empirical results do not imply necessary results for policy. The prior question of whether to base policy upon individual or social preferences is ethical and requires a political not empirical solution. But such decision making requires information concerning social preferences. This and other studies suggest that severity per se is an important, independent determinant of these social preferences.

5 Conclusions

Data obtained in this limited study are consistent with the severity hypothesis. They suggest that the hypothesis is robust; that it is consistent with significantly different approaches to the measurement of social value. The magnitude of the severity effect found here is also consistent with results in the literature which are, as noted, quite broad. The present study has, however, highlighted a problem which, to our knowledge, has not been discussed in the literature. With three variables – value, utility and severity – there is not a single functional relationship between value and utility but a different relationship for each initial level of severity. This results in a variable relationship between incremental utility and value. This leads to ambiguous implications for policy. The issue requires further research.

References

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Appendix 1 Health State Descriptions

HS1

A person in Health State A experiences

- **severe** pain which is serious **3-4 times weekly** and **often** interferes with activities.
- a **lot of difficulty** moving around, does jobs around the house only **very slowly** and has **some difficulty** with personal care tasks such as toileting and dressing.
- **blurred vision**, finds it **difficult to hear things clearly** and has **some difficulty** communicating.

In spite of this, this person is **coping fully**, has **excellent self worth**, is **fully supported** by family and community **relationships** and is **psychologically in excellent health**. Has **excellent life satisfaction**.

A

HS2

A person in Health State B experiences

- **severe** pain which is serious **3-4 times weekly** and **often** interferes with activities.
- a **lot of difficulty** moving around, does jobs around the house only **very slowly** and has **some difficulty** with personal care tasks such as toileting and dressing.

However has **excellent** vision and hearing, and **no trouble communicating**.

Is **coping fully**, has **excellent self worth**, is **fully supported** by family and community **relationships** and is **psychologically in excellent health**. Has **excellent life satisfaction**.

B

HS3

A person in Health State C experiences

- a **lot of difficulty** moving around, does jobs around the house only **very slowly** and has **some difficulty** with personal care tasks such as toileting and dressing.

However has **no pain**, has **excellent** vision and hearing, and **no trouble communicating**.

Is **coping fully**, has **excellent self worth**, is **fully supported** by family and community **relationships** and is **psychologically in excellent health**. Has **excellent life satisfaction**.

C

HS4

A person in Health State X experiences

- depression often, **usually** feels sad or agitated, and has sleeping problems **all the time**. **Often** worried and **sometimes** in despair even to the point of self-harming.
- only **slightly** content with life, does **not** have **much** enthusiasm, and **almost never** feels happy.
- **dissatisfaction** with close relationships and **doesn't enjoy** them **much**, **generally unhappy** with intimate relationships, and **often** feels socially isolated and excluded.
- only **little** self-confidence

In spite of this, this person is able to live **totally independently**, has **no pain**, senses and **communication** are **excellent**, and is **copng fully**.

X

HS5

A person in Health State Y experiences

- depression **very often**, **usually** feels sad or agitated, and has sleeping problems **all the time**. **Often** worried and **sometimes** in despair even to the point of self-harming.
- is **not at all** content, does **not** have **much** enthusiasm, and only **sometimes** feels happy.
- only little self-confidence

In spite of this, is **happy** with and **fully enjoying relationships**, is able to live **totally independently**, has **no pain**, senses and **communication** are **excellent**, and is **copng fully**.

Y

HS6

A person in Health State Z experiences

- depression **very often**, **usually** feels sad or agitated, and has sleeping problems **all the time**. **Often** worried and **sometimes** in despair even to the point of self-harming.
- is **not at all** content, does **not** have **much** enthusiasm, and only **sometimes** feels happy.

In spite of this, has **excellent** self-confidence, is **happy** with and **fully enjoying relationships**, is able to live **totally independently**, has **no pain**, senses and communication are **excellent**, and is **copng fully**.

Z

HS7

A person in Health State A experiences

- depression **very often** and **usually** feels sad or agitated.
- despair **often** and feels like self-harming , or is angry or worried and has trouble sleeping.
- Is **always** tired, **never** feels in control and feels **unable to cope at all**.
- feel like burdens others **a lot**, **usually** feels worthless and has **little** self-confidence.
- **hates** close relationships which are **unpleasant** and make them **very unhappy**.
- **often** feel socially isolated and excluded, and **cannot participate in many** family and social activities.
- **usually** feels pleasure, but is only **sometimes** happy, **somewhat** enthusiastic and **moderately** content with life.

In spite of this,, this person has **no pain**, has **excellent mobility** and **senses**.

A (sortB)A1--

HS8

A person in Health State B experiences

- very often depressed and usually feels sad or agitated.
- often in despair and feels like self-harming , or is angry or worried and has trouble sleeping.
- feels like burdens others a lot, usually feels worthless and has little self-confidence.
- enjoys close relationships little because they make them neither happy nor unhappy.
- sometimes feel socially isolated and excluded, and cannot participate in many family and social activities.
- usually feels pleasure, but is only sometimes happy, somewhat enthusiastic and moderately content with life.

This person is coping **fully**, has **no pain**, has **excellent mobility** and **senses**.

B (sort B)

HS9

A person in Health State C experiences

- usually feels pleasure, but is only sometimes happy, somewhat enthusiastic and moderately content with life.
- enjoys close relationships little because they make them neither happy nor unhappy.
- sometimes feels socially isolated and excluded, and cannot participate in many family and social activities. Sometimes feels socially isolated and excluded, and cannot participate in many family and social activities.

In spite of this, this person has excellent mental health, self worth, is coping fully, has no pain, has excellent mobility and senses. C (sortB A1++)

C

HS10

A person in Health State X experiences the following

- **lot of difficulty** with vision and **difficulty** hearing and **great trouble** communicating.
- **great difficulty** walking and getting around outside
- **cannot do most** jobs around the house and **many** personal tasks are **difficult**.
- **usually** tired and lacking energy, feel that cope **very little** with life's problems and only **occasionally** feel in control of life.
- **little** self-confidence and **usually** feel worthless and feel like burden others **a lot**
- only **sometimes** happy and feel pleasure, **moderately** content and feel only **some** enthusiasm about life.

In spite of this, this person has **no pain**, has **excellent mental health and relationships**.

X (sortB H3--)

HS11

A person in Health State Y experiences the following

- **great difficulty** walking and getting around outside
- **cannot do most** jobs around the house and **many** personal tasks are **difficult**.
- **usually** tired and lacking energy, feel that cope **very little** with life's problems and only **occasionally** feel in control of life.
- **little** self-confidence and **usually** feel worthless and feel like burden others **a lot**
- only **sometimes** happy and feel pleasure, **moderately** content and feel only **some** enthusiasm about life.

In spite of this, this person has **no pain**, has **excellent mental health and relationships**. **Senses** (vision, hearing and communicating) **are excellent**.

Y (sort B H3-)

HS12

A person in Health State Z experiences the following

- **usually** tired and lacking energy, feel that cope **very little** with life's problems and only **occasionally** feel in control of life.
- **little** self-confidence and **usually** feel worthless and feel like burden others **a lot**
- only **sometimes** happy and feel pleasure, **moderately** content and feel only **some** enthusiasm about life.

In spite of this, this person has excellent **mobility, mental health, self worth**, is coping **fully**, has **no pain**, has **excellent senses**.

Z (sortB A1++)

HS13

A person in Health State A experiences

- depression **very often** and **usually** feels sad. **Often** angry and in despair and **often** feels like self-harming, or worried and agitated and has trouble sleeping.
- **occasionally** being full of energy, **sometimes** feels in control and **only partly** copes with life's problems
- feel like burden others **totally, no** self-confidence **at all** and **always** feel worthless.
- **not at all** content or enthusiastic, **never** happy or feel pleasure.

However has no pain or problems with senses, is able to live independently and is fully supported in relationships.

A (J2--)

HS14

A person in Health State B experiences

- depression **very often** and **usually** feels sad. **Often** angry and in despair and feels like self-harming, or worried and agitated and has trouble sleeping.
- **occasionally** being full of energy, **sometimes** feels in control and only **partly** copes with life's problems.
- feeling like burdens others a **moderate** amount, feels only **moderately** confident and **sometimes** even feels worthless.
- being **moderately** content, **somewhat** enthusiastic, and **sometimes** feels happy and pleasure.

However has no pain or problems with senses, is able to live independently and has excellent relationships.

B (J2)

HS15

A person in Health State C experiences

- feeling like burdens others a moderate amount, feels only **moderately** confident and **sometimes** even feels worthless.
- **being moderately** content, **somewhat** enthusiastic, and **sometimes feels** happy and pleasure.

However is coping fully, is not disturbed by mental health problems, has no pain or problems with senses, is able to live independently and is fully supported in relationships.

C (J2++)

HS16

A person in Health State X experiences the following

- anger and depression **often** and **often** has sleeping problems. **Often** worried, sad, in despair and **sometimes** feels like self-harming. **Usually** agitated.
- feeling like a **total** burden to others, **always** feels worthless, and has **no self-confidence**.
- does not enjoy close relationships **much**. They are **unpleasant** and make the person **unhappy**. **Often** feels socially isolated and excluded, and cannot participate in **many** family and social activities.
- pleasure only **sometimes**, and only **sometimes** feels happy and content with life. Feels only **some** enthusiasm about life.
- **always** being tired, **sometimes** feels in control and only **partly** copes with life's problems.

However has no pain or problems with senses, is able to live independently and is fully supported in relationships.

X (I4-)

HS17

A person in Health State Y experiences

- feeling like a **total** burden to others, **always** feels worthless, and has **no self-confidence**.
- does not enjoy close relationships **much**. They are **unpleasant** and make the person **unhappy**. **Often** feels socially isolated and excluded, and cannot participate in **many** family and social activities.
- pleasure only **sometimes**, and only **sometimes** feels happy and content with life. Feels only **some** enthusiasm about life.
- always being tired, sometimes feels in control and only partly copes with life's problems.

However has no pain or problems with mental health or senses, is able to live independently and is fully supported in relationships.

Y (I4)

HS18

A person in Health State Z experiences

- pleasure only **sometimes**, and only **sometimes** feels happy and content with life. Feels only **some** enthusiasm about life.
- Occasionally being full of energy, sometimes feels in control and only partly copes with life's problems.

However is coping fully, is not disturbed by mental health problems, has no pain or problems with senses, is able to live independently and is fully supported in relationships.

Z (I4++)

Appendix 2 Survey questionnaire

How should Medicare value health services?
(RS-WTP v16 Steps)

Thank you for completing this survey.

The project involves completing 2 questionnaires and attending Monash University in Clayton for an hour long face to face interview.

You will be paid \$30 cash after completing the interview.

Please supply your contact details on the last page so that we can contact you for the follow-up questionnaire and the interview.

Introduction

Suppose that you are a public representative on a government committee which directs Medicare. You must decide how to divide the money available between the 2 services. The initial budget is \$40,000 per year.

Each question will ask you the following:

*"Taking everything you believe to be important into account, divide the money available between the 2 services, **a** and **b**, so that the amounts of money indicate your view of how Medicare should value the services.*



*The health benefit from each service lasts for **one** year. The service may be given again, but each year will require new funding.*

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

5 subsid

Please write your answer here:

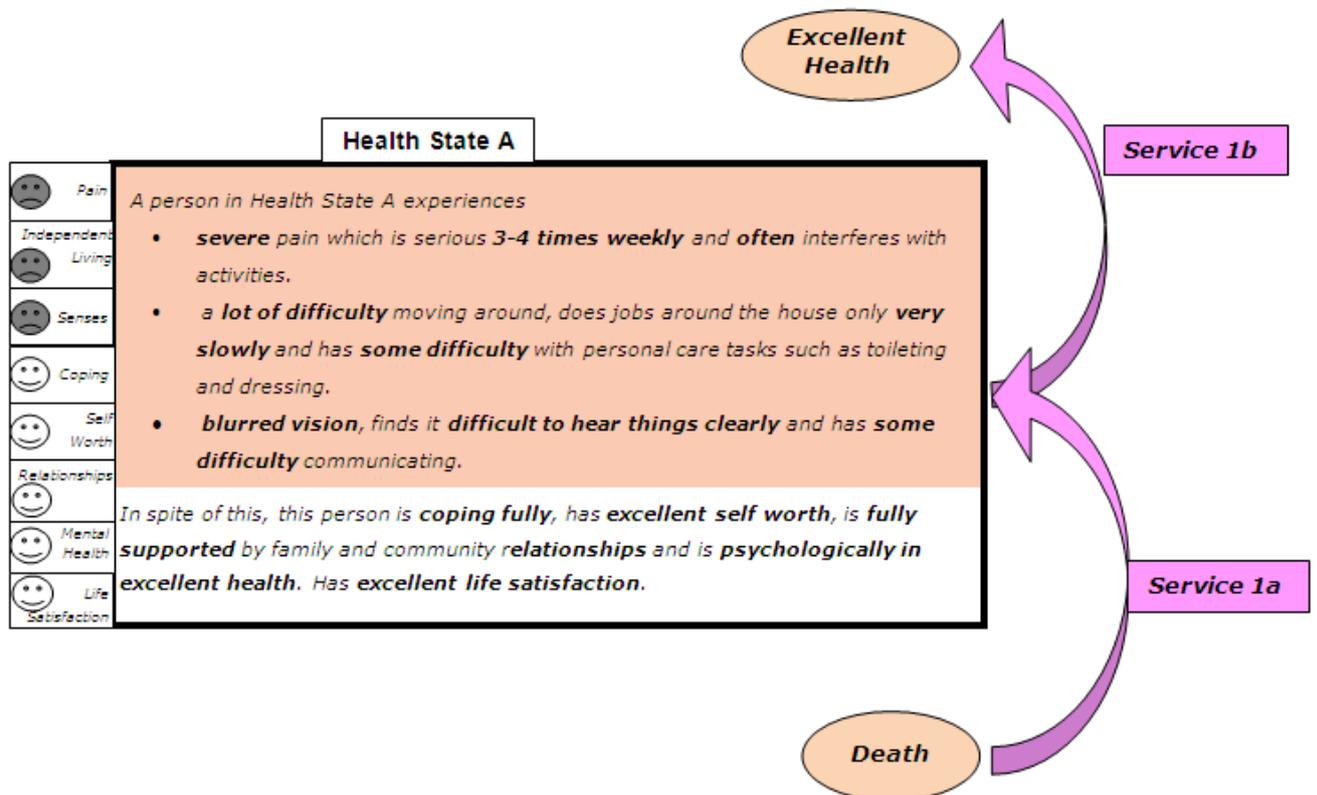
QUESTION 1

6

Step 1: Think about 2 Services:

Service 1a saves a person's life for 1 year and leaves them in Health State A.

Service 1b improves a person's health from Health State A to Excellent Health for 1 year.



Step 2: Allocate the initial budget of \$40,000 between services 1a and 1b to indicate your view of how Medicare should value the services.

*

Only answer this question if the following conditions are met:

° Answer was '1' 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

* Total of all entries must equal 40000

Please write your answer(s) here:

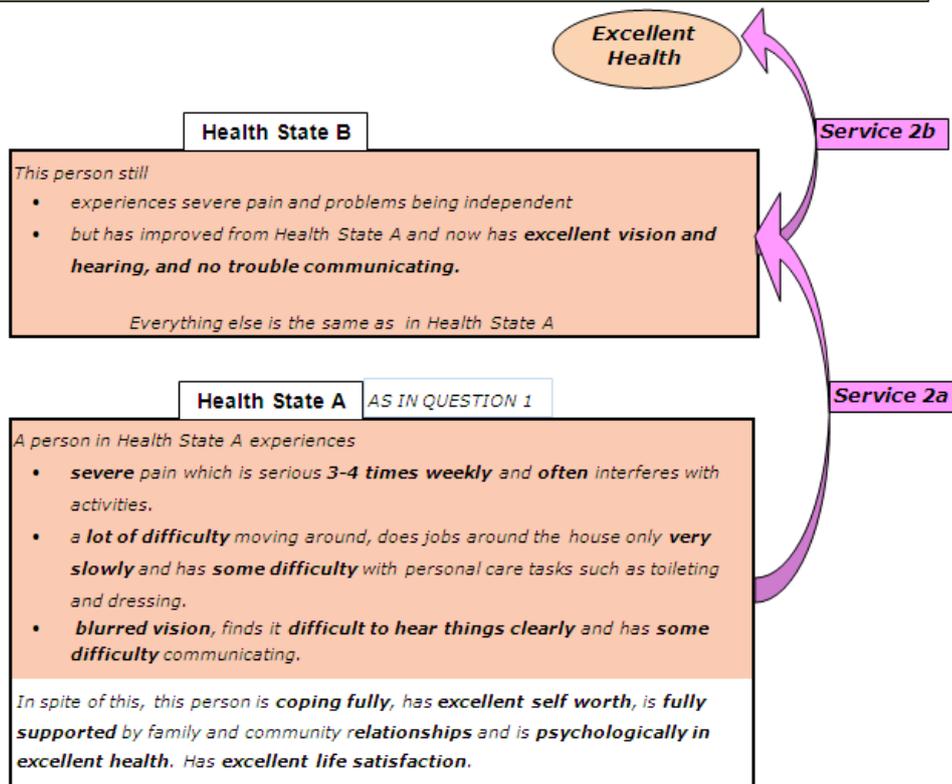
- Allocation to service 1a
- Allocation to service 1b

QUESTION 2

Step 1: Think about 2 different Services:

Service 2a improves a person's health from Health State A to Health State B for 1 year.

Service 2b improves a person's health from Health State B to Excellent Health for 1 year.



Step 2: Allocate your funds between services 2a and 2b to indicate your view of how Medicare should value the services.

You chose to allocate \$ to service 1b in the previous question,
so now \$ is your total amount to allocate.

*

Only answer this question if the following conditions are met:

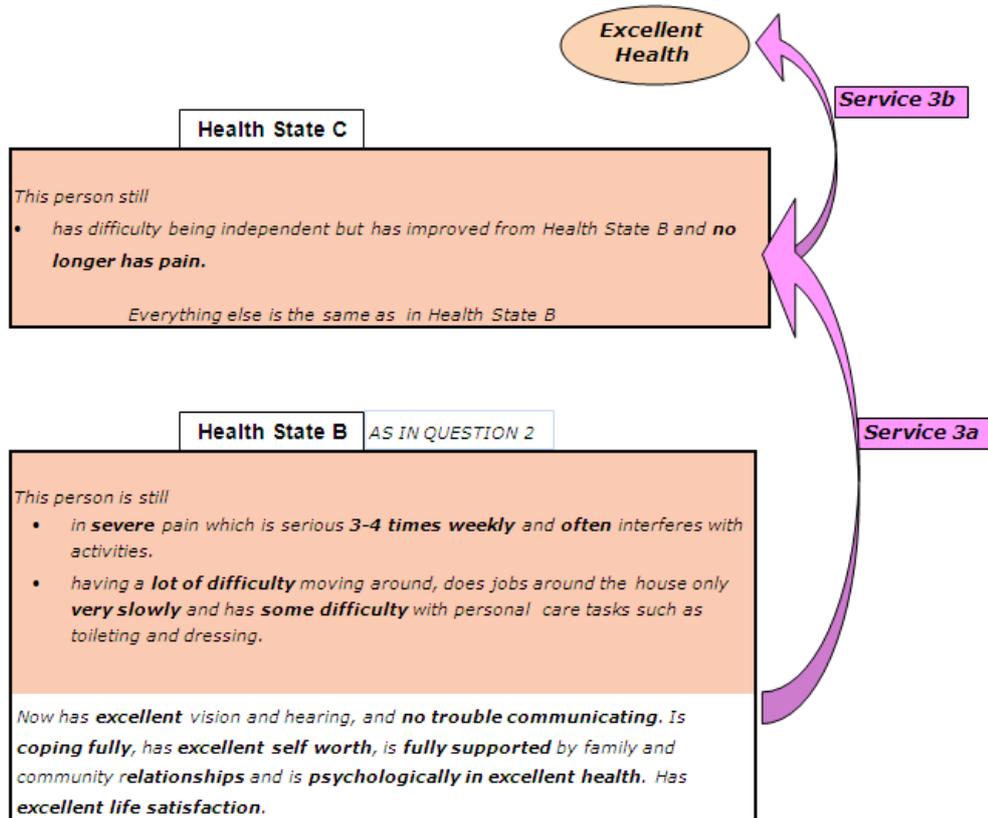
° Answer was 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer(s) here:

- Allocation to service 2a
- Allocation to service 2b

QUESTION 3

Step 1: Think about 2 different Services:
Service 3a improves a person's health from Health State B to Health State C for 1 year.
Service 3b improves a person's health from Health State C to Excellent Health for 1 year.



Step 2: Allocate your funds between services 3a and 3b to indicate your view of how Medicare should value the services.

You chose to allocate \$ funds to service 2b in the previous question.
 Now you have \$ to divide.

*

Only answer this question if the following conditions are met:

° Answer was '1' 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer(s) here:

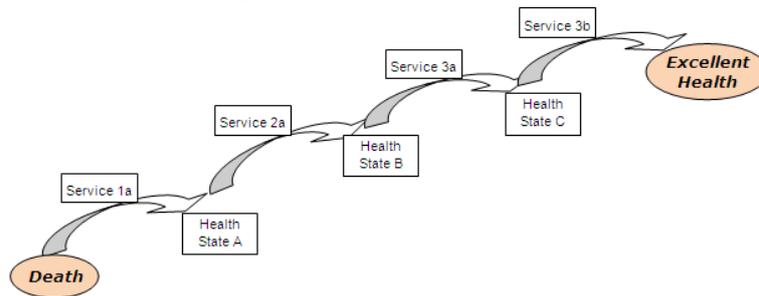
- Allocation to service 3a
- Allocation to service 3b

VALIDATION

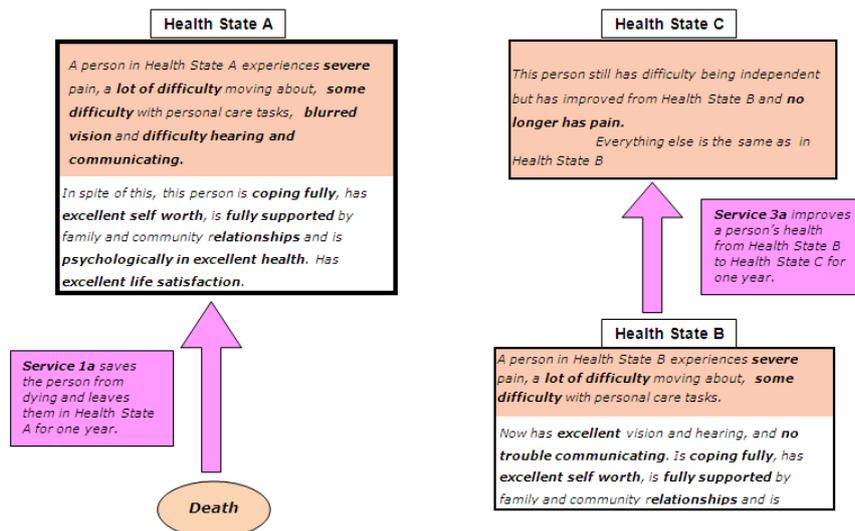
Now please think about your answers to questions 1 to 3. You allocated the following amounts:

Death	Service 1a	Service 2a	Service 3a	Service 3b	Excellent Health
	\$	\$	\$	\$	

Notice that the services in the questions are connected as shown



Compare the amount you gave to Service 1a and Service 3a (**reproduced below**) and decide if they are about the right amounts relative to each other. If not, press <<PREVIOUS and work through the questions again. Or press NEXT >> to continue.



Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

CHECK 1

10 Did you go back and revise your answers? *

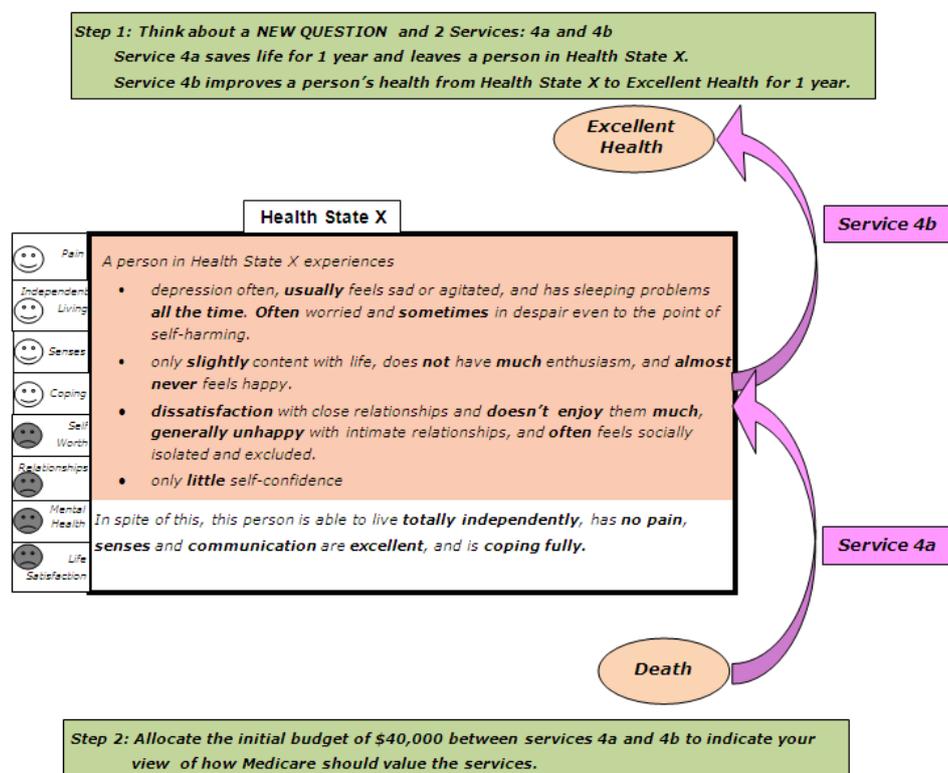
Only answer this question if the following conditions are met:

° Answer was `1` 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Yes
 No

QUESTION 4



Only answer this question if the following conditions are met:

° Answer was `1` 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

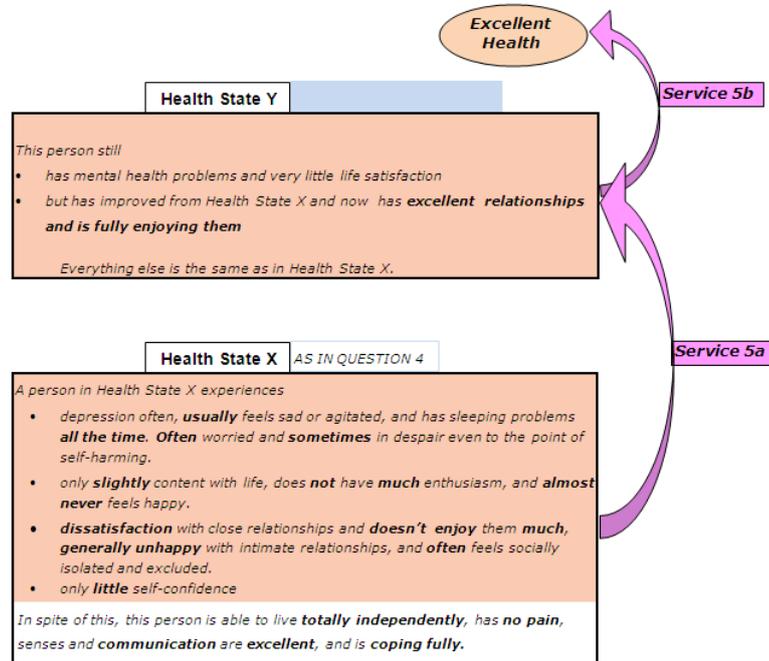
* Total of all entries must equal 40000

Please write your answer(s) here:

- Allocation to service 4a
- Allocation to service 4b

QUESTION 5

Step 1: Think about 2 different Services:
Service 5a improves a person's health from Health State X to Health State Y for 1 year.
Service 5b improves a person's health from Health State Y to Excellent Health for 1 year.



Step 2: Allocate your funds between services 5a and 5b to indicate your view of how much Medicare should value the services.

You chose to allocate \$ to service 4b in the previous question so now \$ is your total amount to divide.

*

Only answer this question if the following conditions are met:

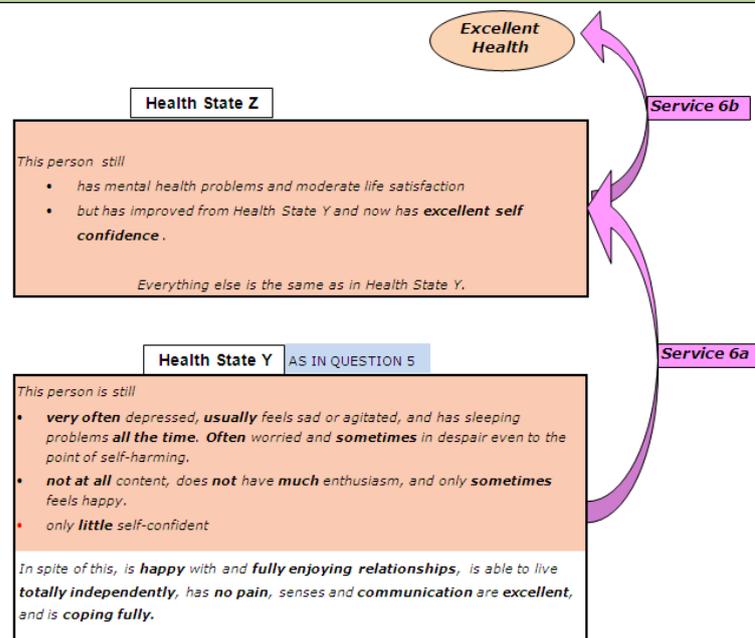
° Answer was '1' 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer(s) here:

- Allocation to service 5a
- Allocation to service 5b

QUESTION 6

Step 1: Think about 2 different Services:
Service 6a improves a person's health from Health State Y to Health State Z for 1 year.
Service 6b improves a person's health from Health State Z to Excellent Health for 1 year.



Step 2: Allocate your funds between services 6a and 6b to indicate your view of how Medicare should value the services.

You chose to allocate \$ to service 5b in the previous question so now \$ is your total amount to divide.

*

Only answer this question if the following conditions are met:

° Answer was '1' 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer(s) here:

- Allocation to service 6a
- Allocation to service 6b

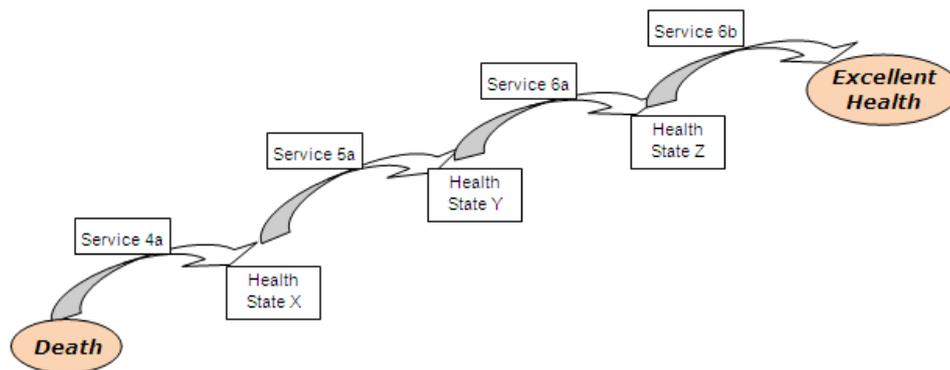
VALIDATION 2

Now please think about your answers to questions 4 to 6.

You allocated the following amounts:

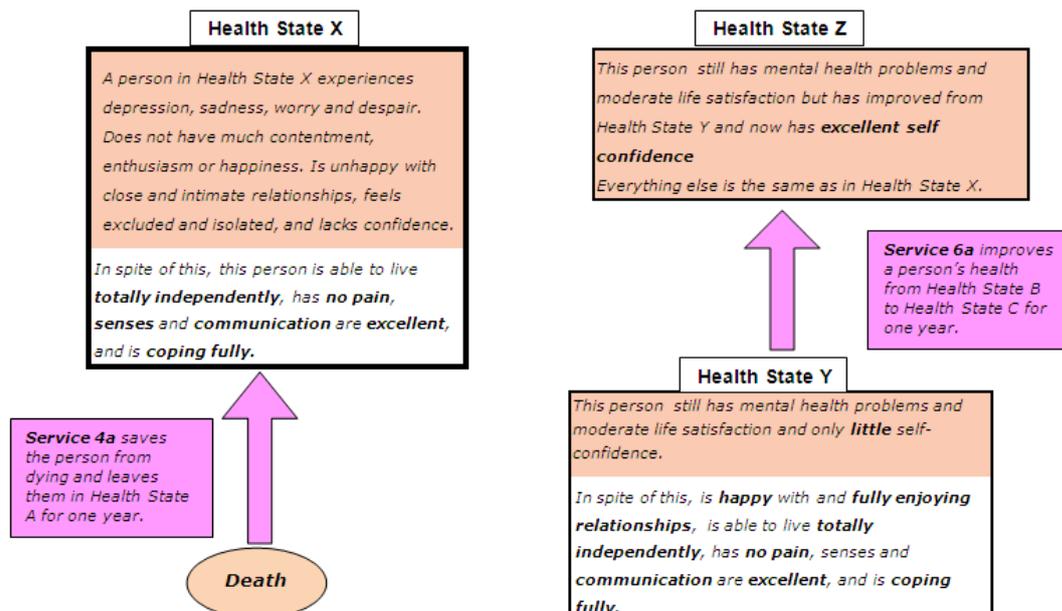
Death	Service 4a	Service 5a	Service 6a	Service 6b	Excellent Health
	\$	\$	\$	\$	

Notice that the services in the questions are connected as shown



Compare the amount you gave to Service 4a and Service 6a (**reproduced below**) and decide if they are about the right amounts relative to each other.

If not, press <<Previous and work through the questions again. Or press Next >> to continue.



Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

CHECK 2

15 Did you go back and revise your answers? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Yes
 No

CONTACT DETAILS

16 Please fill in your contact details so we can arrange the interview after you complete both surveys. *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer(s) here:

- First name
- Last name
- Mobile phone number
- Alternate phone number (enter 0 if not applicable)

Demographics

17 In what year were you born? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer here:

18 Where were you born? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Australia
 Other

19 Enter your postcode in the box below: *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer here:

20 How well do you understand/speak English? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Very well
- Well
- Not well
- Not at all

Demographics 2

21 Who are you currently living with? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- By myself
- Family, including husband/wife/partner/children
- Friends/shared accommodation
- Other (specify)

22 Are you: *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Married or living with a partner
- Single: never married
- Single: widowed
- Single: divorced or separated

23 Currently, what is the highest level of education you have reached (even if not completed)? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Primary school
- High school
- Certificate, Trade
- Advanced Diploma, TAFE
- Bachelor Degree
- Postgraduate Degree, Graduate Diploma

24 What year level did you reach? *

Only answer this question if the following conditions are met:

° Answer was `2` 'High school' at question '23 [D8]' (Currently, what is the highest level of education you have reached (even if not completed)?) *and* Answer was `1` 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Equivalent to Yr 7 in Australia
- Equivalent to Yr 8 in Australia
- Equivalent to Yr 9 in Australia
- Equivalent to Yr 10 in Australia
- Equivalent to Yr 11 in Australia
- Equivalent to Yr 12 in Australia

25 What trade qualification, apprenticeship did you do? *

Only answer this question if the following conditions are met:

° Answer was `3` 'Certificate, Trade' at question '23 [D8]' (Currently, what is the highest level of education you have reached (even if not completed)?) *and* Answer was `1` 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer here:

26 What course did you do at TAFE? *

Only answer this question if the following conditions are met:

° Answer was `4` 'Advanced Diploma, TAFE' at question '23 [D8]' (Currently, what is the highest level of education you have reached (even if not completed)?) *and* Answer was `1` 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer here:

27 Name of course? *

Only answer this question if the following conditions are met:

° Answer was `5` 'Bachelor Degree' or 'Postgraduate Degree, Graduate Diploma' at question '23 [D8]' (Currently, what is the highest level of education you have reached (even if not completed)?) *and* Answer was `1` 'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please write your answer here:

28 Which best describes your current work situation? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Full time: self-employed or employee
- Part-time or casual: self-employed or employee
- Unemployed, seeking work
- Not in the labour force/retired/pensioner
- Full-time carer
- Student
- Other

29 Choose the option that corresponds with your weekly pre-tax household income (include all sources).

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Below \$350pw (less than \$18,200pa)
- \$350-649pw (\$18,200 - 33,748pa)
- \$650-999pw (\$33,800 - 51,948pa)
- \$1000-1399pw (51,949 - 72,799)
- \$1400-1999pw (72,800 - 103,948pa)
- \$2000-2999pw (104,000 - 155,948pa)
- Above \$3000pw (above \$156,000pa)

30 Are you the main wage-earner in your household? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Yes
- No

31 How would you rate your current level of health, for someone of your age? *

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

Please choose **only one** of the following:

- Excellent
- Very good
- Good
- Fair
- Poor
- Very poor

32 Thank you for completing our survey, the next survey will be sent to you in two weeks and then you will be scheduled for an interview soon after.

We appreciate your involvement in our research.

Press SUBMIT now.

Only answer this question if the following conditions are met:

° Answer was `1`'Yes' at question '1 [CLAY]' (Are you able to come to Monash University Clayton for the focus interview during business hours?)

29.06.2011 – 00:00

Submit your survey.

Thank you for completing this survey