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ESTIMATING SF-6D HEALTH STATE UTILITY VALUES FOR COMORBID HEALTH CONDITIONS

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BACKGROUND

The prevalence of comorbidities increases with age but preference-based utilities are generally obtained from cohorts who have a single condition. This can cause problems when populating health states in economic models which represent more than one condition. Analysts use the mean utilities from the cohorts with the single conditions to estimate the mean utility for a cohort with comorbidities. There is currently no consensus on which is the most appropriate method to combine these data and the different techniques can produce very different results.

OBJECTIVE

To compare the accuracy of different methods (minimum, multiplicative, additive, a linear regression) used to estimate health state utility values for comorbid health conditions.

METHOD

Data collected during five rounds of the Welsh Health Survey (n=64,437) were used to generate mean SF-6D scores for cohorts with specific health conditions. These data were then used to estimate mean SF-6D scores for cohorts with comorbid health conditions (n= 32) using the following methods:

The **additive** method assumes a constant absolute decrement relative to the baseline:

$$U^{Add}_{A,B} = U_{nA,nB} - \left((U_{nA} - U_A) + (U_{nb} - U_B) \right)$$

The **multiplicative** method assumes a constant proportional decrement relative to the baseline:

$$U^{Mult}_{A,B} = U_{nA,nB} \cdot \left(\frac{U_A}{U_{nA}} \right) \cdot \left(\frac{U_B}{U_{nB}} \right)$$

The **minimum** method assumes the effect on HRQoL is equivalent to the most severe of the single health conditions:

$$U^{Min}_{A,B} = \min\left(U_{nA,nB}, U_A, U_B \right)$$

A simple **linear** model obtained using an OLS regression, incorporating a combination of the above methods:

$$U^{OLS}_{A,B} = \beta_0 + \beta_1 \cdot \min\left((U_{nA} - U_A), (U_{nb} - U_B) \right) + \beta_2 \cdot \max\left((U_{nA} - U_A), (U_{nb} - U_B) \right) + \beta_3 \cdot \left(U_{nA,nB} \cdot \frac{U_A}{U_{nA}} \cdot \frac{U_B}{U_{nb}} \right) + \varepsilon$$

U = mean SF-6D, Superscripts: Add = additive, Mult = multiplicative, Min = minimum, OLS = linear

Subscripts: A = condition A; B = condition B; A,B = condition A & condition B; nA = not condition A; nB = not condition B; nAnB = not condition A & not condition B

RESULTS

Table 1 Comparing abilities to estimate SF-6D scores

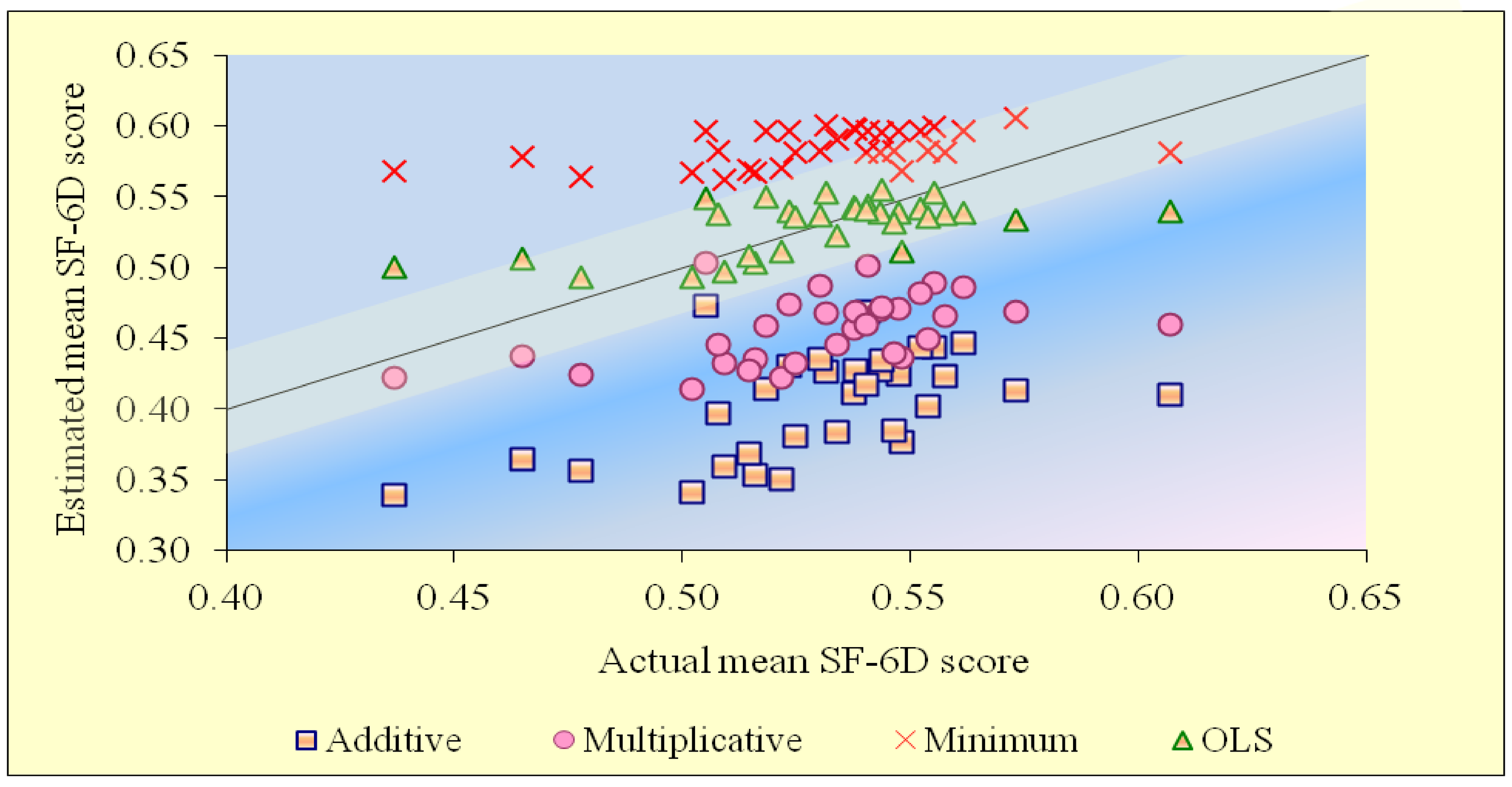
	Actual	Estimated			
		Additive	Multiplicative	Minimum	Linear Model
Mean SF-6D score	0.5301	0.4039	0.4565	0.5848	0.5301
Min SF-6D score	0.4368	0.3393	0.4139	0.5620	0.4935
Max SF-6D score	0.6068	0.4733	0.5038	0.6053	0.5549
Range:	0.1700	0.1340	0.0899	0.0433	0.0614
Mean error		-0.1209	-0.0745	0.0546	0.0000
Maximum absolute error		0.1924	0.1496	0.1316	0.0669
MAE		0.1209	0.0747	0.0563	0.0191
MSE		0.0157	0.0064	0.0038	0.0006
RMSE		0.1252	0.0799	0.0613	0.0254
Proportion within |0.01|		0%	3%	0%	31%
Proportion within |0.025|		0%	6%	6%	75%
Proportion within MID |0.041|		3%	13%	25%	88%

- The actual mean SF-6D scores for the sub-groups with comorbidities range from 0.465 to 0.607
- The additive method tends to under-estimate the scores (ME: -0.121, MAE: 0.121)
- The multiplicative method tends to under-estimate the scores (ME: -0.075, MAE: 0.075)
- The minimum method tends to over-estimate the scores (ME: 0.055, MAE: 0.056)

Table 2: Errors sub-grouped by actual SF-6D

Actual SF-6D	n	Additive	Multiplicative	Minimum	Linear Model
Mean error					
SF-6D < 0.51	7	-0.1105	-0.0463	0.0880	0.0249
0.51 ≤ SF-6D < 0.50	18	-0.1271	-0.0762	0.0528	0.0003
0.50 ≤ SF-6D	7	-0.1399	-0.0943	0.0260	-0.0256
Mean absolute error					
SF-6D < 0.51	7	0.1105	0.0463	0.0880	**0.0308**
0.51 ≤ SF-6D < 0.50	18	0.1271	0.0762	0.0528	**0.0120**
0.50 ≤ SF-6D	7	0.1399	0.0943	0.0334	**0.0256**
Accurate to within the MID |0.041|					
SF-6D < 0.51	7	14%	43%	0%	**67%**
0.51 ≤ SF-6D < 0.50	18	0%	5%	16%	**95%**
0.50 ≤ SF-6D	7	0%	0%	71%	**86%**

Figure 1: Actual and estimated SF-6D scores



- The linear model performs well in the central area but tends to under-predict scores at the top of the range and over-predict scores at the bottom of the range
- The linear model performs best in terms of errors and the proportion of estimated scores within the SF-6D MID (|0.041|) when sub-grouped by actual SF-6D category

CONCLUSIONS

While the linear model gave the most accurate results in these data, additional research is required to validate these findings.

REFERENCES

National Centre for Social Research, Welsh Health Survey, [computer file]. Colchester, Essex: UK Data Archive [distributor], October 2008. SN: 6052

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