SUPPLEMENTARY MATERIAL

1. COPY OF SURVEY INSTRUMENT

Attached are:

Attachment 1: The survey (version 9 as an example of the 10 versions, with the versions differing only by the specific choice sets that were presented)

Attachment 2: The 10 blocks of choice sets included in each of the 10 survey versions

2. METHODS FOR DATA ANALYSIS

A multinomial logit (MNL) model was used to evaluate preferences across the whole sample.[1 2] The model was specified according to a linear utility function (Equation 1), where U(A,B) represents the overall utility associated with choosing to prioritise person A or B for surgery, K represents the seven attributes included in the choice sets, β_k and X_k represent the vector of parameters and variables included in the model, and ε represents a random error term.

Equation 1:

$$U(A,B) = \sum_{k=1}^{K} \beta_k X_k + \varepsilon$$

Preliminary modelling utilising MNL specifications confirmed that the main effects for the attributes chance and wait time (but not age) were linear; therefore these two attribute levels were specified as continuous variables in the model. All other attribute levels were specified using effect coding.[3] All two-way interactions between current level of obesity, age of person needing surgery and chance of maintaining weight loss were tested in the model; however, only two interactions were found to be significant and their inclusion did not improve the model fit (using Akaike Information Criterion AIC / Number of observations as the criterion for fit N). Therefore, the final model was specified to include main effects only.

Whilst the main focus of this paper is on the average preferences (based on the MNL model), the extent to which preferences differed across different respondent subgroups was explored using a latent class (LC) model.[1 2] The LC model was specified with four preference classes (the optimal number of classes according to AIC/N). Individual respondent

characteristics (Table 2 main paper) were included to explain class membership using a backward step approach. A conservative significance threshold was used, with characteristics retained in the model if they were significant in explaining class membership for one or more classes at the 20% level ($p<0.20$).

To develop a prioritisation system based on the preferences of the public that could be used to prioritise individuals for bariatric surgery, "priority weights" were derived to indicate the relative importance of the different criteria. These weights were developed based on the complete sample preferences in the MNL model, by estimating the marginal rates of substitution indicating the trade-offs respondents are willing to make between different prioritisation criteria. Marginal rates of substitution were estimated for each criterion using a ratio of the relevant model parameters, according to standard DCE methods.[4] The priority weights are presented based on the use of the attribute for effectiveness (chance of maintaining weight loss) as the denominator, since this attribute was highly significant in all models and classes. That is, for the MNL model, the marginal rates of substitution represents the amount of effectiveness (i.e. chance of maintaining weight loss) that respondents were willing to trade in order to prioritise an individual who met other desirable criteria that were considered to be relevant. Marginal rates of substitution and consequently priority weights were estimated for all criteria included in the model, including those that did not reach significance, since the priority weights themselves represent a ratio of parameters which may be significantly different to zero (even if the raw parameter is not).

The priority weights represent the relative importance of different criteria to the public, and they indicate this importance on an interval scale. They could therefore be summed for any individual patient requiring surgery in order to rank patients, from the public perspective.

3. RESULTS OF LATENT CLASS MODEL TO EXPLORATE PREFERENCE HETEROGENEITY

Whilst the MNL model provides the results of the average respondent from a public sample that reflects the age and gender distribution of the Australian population, it does not indicate the extent to which preferences may vary across the sample. A LC model revealed four distinct preference classes within the overall public sample. The four class LC model (AIC/N=1.119) had a superior fit to both the MNL model (AIC/N=1.235) and a three class LC model (AIC/N=1.129); whilst attempts to estimate a fifth class resulted in identification problems. Six socio-demographic characteristics significantly explained class membership at the 20% level and were retained in the model; however, only four of these (BMI, History of weight loss surgery, AQoL utility score, education level) were significantly associated with class membership at the 5% level in the final model ($p \leq 0.05$).

Whilst the direction of preference was generally consistent with that for the average MNL model for most DCE attributes, the relative importance of criteria varied between classes (Table S1). Notably, the classes were distinguished by the relative importance of commitment to a healthy lifestyle, and a preference to prioritise (or not) by age, family history and lifestyle commitment.

Respondents had a 0.335 probability of belonging to latent Class1. Class 1 exhibited similar preferences to the overall sample (as measured by the MNL), except that a significant preference to prioritise those with a family history of obesity was not observed. Furthermore, commitment to maintaining a healthy lifestyle was especially important as a criterion in this group. This class appears to believe that personal responsibility for one's own health, including obesity, matters. Members of this class were relatively less likely to have a BMI

≥25 kg/m2 or to have experience of weight management surgery for themselves or a close family member, and were relatively more likely to have good health (AQoL8D≥0.8).

The next largest class, Class 3 (0.263 probability of membership), exhibited similar preferences to the overall sample, with two important exceptions. Importantly, this class did not want to prioritise by time on waitlist, or by lifestyle commitment. Members of this class were the least likely to have a BMI ≥25 kg/m2 or to be highly educated (diploma or degree).

Class 4 had a similar probability of membership (0.253) to Class 3. Class 4 exhibited similar preferences to the overall sample, except that commitment to a healthy lifestyle was relatively less important and age was important as decision criteria. This class wanted to strongly prioritise 50 year olds over 20 year olds.

Class 2 had the lowest probability of membership (0.148), but still represented a substantial proportion of the sample. Class 2 exhibited very similar preferences to the overall sample, except that members of this class wanted to prioritise 20 year olds over 50 year olds, making their preferences in opposition to Class 4. Thus, whilst the average preferences are reported above from the MNL model, the LC model suggests substantial variation between respondents, but particularly for the importance of age as a criterion. Whilst on average age is considered to be of little importance, this hides several divergent subgroup views.

References

1. Hensher DA, Rose JM, Greene WH. *Applied Choice Analysis: A Primer*. New York: Cambridge University Press, 2005.
2. Whitty JA, Stewart S, Carrington MJ, et al. Patient preferences and willingness-to-pay for a home or clinic based program of chronic heart failure management: findings from the Which? Trial. PLoS ONE 2013;**8**(3):e58347.
3. Bech M, Gyrd-Hansen D. Effects coding in discrete choice experiments. Health Econ 2005;**14**(10):1079-83.
4. Bridges JF, Hauber AB, Marshall D, et al. Conjoint analysis applications in health-a checklist: a report of the ISPOR Good Research Practices for Conjoint Analysis Task Force. Value Health 2011;**14**(4):403-13.

Table S1: LC Model including sociodemographics

Attribute	Level		CLASS 1						CLASS 2						CLASS 3						CLASS 4				
			Coefficient	SE	P	95%CI (L)	95%CI (U)		Coefficient	SE	P	95%CI (L)	95%CI (U)		Coefficient	SE	P	95%CI (L)	95%CI (U)		Coefficient	SE	P	95%CI (L)	95%CI (U)
Utility function																									
Level of obesity	Obesity		-0.258						-0.455						-0.245						-0.612				
	Severe Obesity		-0.028	0.029	0.335	-0.084	0.029	**	0.087	0.044	0.048	0.001	0.173		0.015	0.026	0.576	-0.037	0.066	*	0.052	0.031	0.090	-0.008	0.113
	Very Severe Obesity	***	0.286	0.032	0.000	0.223	0.349	***	0.368	0.123	0.003	0.127	0.608	***	0.230	0.035	0.000	0.161	0.300	***	0.559	0.038	0.000	0.485	0.634
Obesity-related conditions	At risk of co-morbidity		-0.108						-0.244						-0.290						-0.346				
	Already has co-morbidity	***	0.108	0.024	0.000	0.062	0.155	**	0.244	0.101	0.016	0.046	0.441	***	0.290	0.041	0.000	0.211	0.370	***	0.346	0.031	0.000	0.285	0.408
Age of person	20yrs		0.105						0.317						0.036						-0.582				
	35yrs		-0.054	0.096	0.573	-0.241	0.134		0.166	0.153	0.278	-0.134	0.467		0.023	0.074	0.755	-0.121	0.167		0.110	0.098	0.263	-0.082	0.301
	50yrs		-0.052	0.051	0.310	-0.151	0.048	***	-0.483	0.091	0.000	-0.661	-0.304		-0.059	0.073	0.424	-0.202	0.085	***	0.473	0.060	0.000	0.356	0.590
Family history	No family history		-0.024						-0.148						-0.079						-0.175				
	Family history		0.024	0.017	0.151	-0.009	0.057	***	0.148	0.031	0.000	0.088	0.208	***	0.079	0.020	0.000	0.040	0.117	***	0.175	0.019	0.000	0.138	0.211
Chance of maintaining wt loss	per %	***	0.019	0.001	0.000	0.016	0.021	***	0.048	0.009	0.000	0.030	0.065	***	0.007	0.001	0.000	0.004	0.009	***	0.014	0.002	0.000	0.011	0.018
Commitment	Not maintained healthy lifestyle		-1.604						-0.927						-0.034						-0.477				
	Maintained healthy lifestyle	***	1.604	0.059	0.000	1.489	1.719	***	0.927	0.204	0.000	0.527	1.327		0.034	0.035	0.331	-0.034	0.102	***	0.477	0.042	0.000	0.394	0.560
Time of wait list	per mth	***	0.037	0.002	0.000	0.032	0.041	***	0.044	0.012	0.000	0.021	0.067		0.003	0.002	0.232	-0.002	0.008	***	0.076	0.004	0.000	0.069	0.084
Class probability model																									
Constant			0.020	0.204	0.920	-0.380	0.421	**	-0.493	0.249	0.048	-0.982	-0.004	*	0.408	0.232	0.079	-0.047	0.864		0.000	F.P.			
BMI	>=25	*	-0.125	0.073	0.087	-0.268	0.018		0.000	0.099	0.998	-0.195	0.194	**	-0.168	0.084	0.045	-0.332	-0.004		0.000	F.P.			
Previous surgery to manage wt	Yes - self or family	**	-0.378	0.153	0.014	-0.678	-0.077		0.069	0.272	0.801	-0.464	0.602		0.066	0.152	0.665	-0.232	0.364		0.000	F.P.			
AQoL-8D utility score	>=0.8	***	0.195	0.076	0.010	0.047	0.344		0.142	0.114	0.212	-0.081	0.366		-0.128	0.103	0.213	-0.330	0.074		0.000	F.P.			
State	South Australia		-0.073	0.084	0.387	-0.237	0.092		-0.028	0.112	0.804	-0.247	0.192		-0.145	0.094	0.123	-0.328	0.039		0.000	F.P.			
Gender	Female		0.112	0.074	0.127	-0.032	0.257		0.076	0.121	0.530	-0.162	0.314		-0.008	0.086	0.929	-0.177	0.161		0.000	F.P.			
Education	Diploma or degree		0.030	0.127	0.816	-0.220	0.279		0.083	0.221	0.708	-0.350	0.515	***	-0.411	0.130	0.002	-0.665	-0.157		0.000	F.P.			
Estimated class probability			***0.335***						***0.148***						***0.263***						***0.253***				