(How) Should Cost-Effectiveness Analysis Accommodate Heterogeneity in Patient Preferences?

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BACKGROUND: Individual patients may vary in terms of: preferences for different outcomes, both in terms of therapeutic effects and adverse events; risk preference (individuals may be risk-neutral, risk-seeking or risk-averse); and personal decision rule (for example utility maximization or regret minimization). In this poster, we use a simple example analysis of three treatments to explore the accommodation of heterogeneity in patient preferences in cost-effectiveness analysis.

METHODS: We consider three treatments A, B and C. Treatment C is a 'no treatment' option that must be available if patients decline treatments A and B. An incremental cost-effectiveness analysis has been performed and indicates that treatment A is cost-effective, and that treatments B and C are not. Using the results of the incremental analysis as basis for decision-making, treatments A (cost-effective) and C (required option if patient declines treatment A) would made be available.

Patients may vary in their preferences for the three treatments. Given three treatment options, there are six possible subpopulations of patients with respect to their patient preferences (see table 1). These differences in the preferences for treatments may reflect heterogeneity in individual valuation of clinical outcomes and treatment attributes, risk preferences with respect to uncertain outcomes, and the decision rule patients employ when choosing treatment. These differences may arise due in exogenous factors such as age, family situation, employment, and treatment history, disease and treatment history, or may simply be inherent.

We assume that a fully informed patient's utility will be maximised if they are able to choose their preferred treatment, regardless of the expected clinical outcomes. We then consider the impact on health-related costs and total population utility of offering treatment option B alongside options A (cost-effective) and C ('no treatment') , even though the fully incremental analysis suggests that option B is not cost-effective.

Table 1: Subpopulations based on patient preference

Sub-population based on treatment preference	Treatment Preference Ranking (most preferred to least preferred)	Treatment choice if B is available	Treatment choice if B is not available
1	A > B > C	A	A
2	A > C > B	A	A
3	C > A > B	C	C
4	C > B > A	C	C
5	B > C > A	B	C
6	B > A > C	B	A

RESULTS Considering the six subpopulations listed in table 1, we don't need to explicitly consider subpopulations 1 (A > B > C) and 2 (A > C > B) as they will choose option A regardless of whether option B is available or not. We also don't need to explicitly consider subpopulations 3 (C > A > B) and 4 (C > B > A) as they will choose option C regardless of whether option B is available or not. These leaves subpopulations 5 (B>C>A) and 6 (B>A>C) who will select option B if it is available and option A and C respectively if it is not. For subpopulation 5, whether the provision of option B increases or decreases aggregate population utility will depend on its cost-effectiveness compared to C for subpopulation 6 patients. If B is cheaper than C, then it will dominate C as it is preferred in this subpopulation (Brazier et al. 2009). If B is more expensive than C, the cost-effectiveness of B compared with C based on population utilities may be a reasonable proxy for its cost-effectiveness in subpopulation B patients. Given that C is preferred to A in this subpopulation, there is no reason to believe that the utility associated with treatment C is below the population average.

For subpopulation 6, whether the provision of option B increases or decreases aggregate population utility will depend on its cost-effectiveness compared to A for subpopulation 6 patients. If B is cheaper than A, then it will dominate A as by it is preferred in this subpopulation. If B is more expensive than A, then we know that it will not be cost-effectiveness compared with A based on population utilities as it was not identified as the cost-effective option in a fully incremental option. In this case we need to trade-off the increase of utility for subpopulation 6 patients against the opportunity cost falling on the wider population

Table 2: Potential cost-effectiveness decision rules accounting for heterogeneity in patient preferences (three treatment case)

Case	Provide B
1. B is cheaper than A and C	Yes
2. B is cheaper than A and cost-effective compared with C	Yes
3. B is more expensive than A or B is more expensive than C and not cost-effective compared with C	If the loss of utility in other populations arising from the additional cost of providing treatment B to this subpopulation is (likely to be) offset by the increase in utility in this subpopulation

DISCUSSION: This will require a judgement as to whether the loss of utility in other populations arising from the additional costs of providing treatment A to this subpopulation is offset by the increase in utility in this subpopulation. This may be resolved as part of a deliberative decision-making process, potentially informed by both the results of incremental and average cost-effectiveness analysis. Presentation of the results in terms of incremental net-monetary benefit may be helpful to this process (Paulden et al. 2020). In addition, qualitative research exploring the underlying basis for heterogeneity in patient preferences may also be supportive.

REFERENCES:

Brazier, John E., Simon Dixon, and Julie Ratcliffe. 'The Role of Patient Preferences in Cost-Effectiveness Analysis: A Conflict of Values?' PharmacoEconomics 27, no. 9 (September 2009): 705–12.

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