Reconciling ACEA and MCDA: Is There a Way Forward for Measuring Cost-Effectiveness in the U.S. Healthcare Setting?

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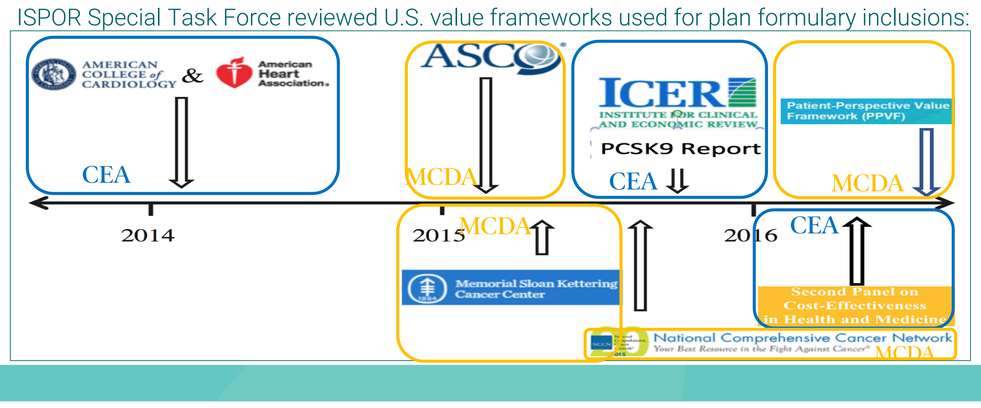
Background

ISPOR Special Task Force reviewed U.S. value frameworks used for plan formulary inclusions:



Aim

To explore conditions for alignment between decision rules derived from Augmented Cost Effectiveness Analysis (ACEA) and Multi-Criteria Decision Analysis (MCDA).

Alignment depends on consistency of trade-offs derived from each model.

Methods

Main assumptions:

- QALY-anchored models: health gain measured as QALYs.
- Trade-offs derived from indifference between having or not having access to a medical technology.
- ACEA model: Trade-off derived as willingness-to-pay (WTP) from the expected utility of a representative citizen.
- MCDA model: Trade-off derived as value trade-off (VTO) from an elicited multi-attribute utility function.
- Role of insurance: smoothing consumption across disease states.

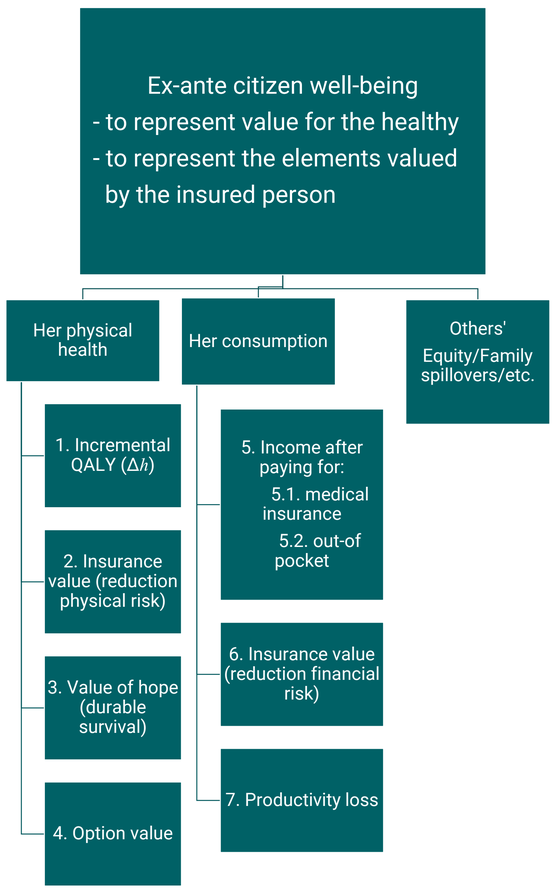
Model and Results

Two mutually independent attributes:

- monetary value of consumption (income change).
- health gain measured in QALYs.

Mutual independence between health and consumption implies a hierarchical structure

The novel elements of value can be organized accordingly into this hierarchical structure



Health and consumption are the two attributes in both ACEA and MCDA

ACEA model

Expected Utility Theory (EUT)

Trade-off defined as WTP: marginal rate of substitution between consumption and health from EUT.

- Two states: sick (s) with probability π and well (w) with probability $(1-\pi)$

$$E(u) = \pi u(c^s, h^s) + (1-\pi)u(c^w, h^w)$$

- Role of medical insurance: decreases WTP by:
  - smoothing consumption and approaching trade-off in well and sick states.
  - increasing expected marginal utility of income.

MCDA model

Multi-Attribute Utility Function (MAUT)

VTO derived from:

- elicited scaling constants k_c and k_h as indifference probabilities.
- marginal rate of substitution between consumption and health from MAUT value function:

$$u(c,h) = k_c u^c(c) + k_h u^h(h) + K k_c k_h u^c(c) u^h(h)$$

$$K = \frac{1 - k_c - k_h}{k_c k_h}$$

WTP and VTO defined as marginal rate of substitution (MRS):

$$WTP \equiv MRS(c^s, h^s) = -\frac{dc^s}{dh^s} \quad E(u)_{no\ treat} = E(u)_{treat}$$

$$VTO \equiv MRS(c,h) = -\frac{dc}{dh} \quad u(c,h) = constant$$

From the analysis of change in trade-off between health and consumption, as WTP in ACEA and as VTO in MCDA

Reconciling ACEA and MCDA Condition 1: *In MCDA multiplicative models, the interaction term scaling constant is non-negative:*

$$K \geq 0$$

Sign of changes in trade-off between consumption and health from changes in factors:

Factor:	ACEA WTP	MCDA VTO
Cost of medical technology	↓	↓
Income	↑	↑
Severity of disease	↑	↕
Risk aversion	Reinforces changes from other factors	↕

Similar conditions from optimization models in the literature:

- Garber and Phelps (1997) model with life-cycle utility.
- Smith and Keeney (2005) multiplicative model between consumption and health in a multi-period EUT model.

Discussion

- The analysis presented in this paper builds on the variability of the cost-effectiveness threshold as derived from the variability of trade-offs between lifetime health and consumption and of the alternative of socially determined commitments to funding health care availability.
- We find that trade-offs change with income, medical spending, severity of disease, and risk attitudes. Changes in income and medical spending affect these trade-offs similarly in ACEA and MCDA, with increased trade-off with larger income, and decreased trade-off with larger medical spending.
- Increase in income can be obtained through larger insurance premiums. Severity of disease can drive variation in the WTP and VTO trade-offs.

Conclusion

- Aligned changes in trade-offs in both models, derived from changes in income and medical costs would result in similar decisions in an ACEA model and a QALY-anchored MCDA model.
- A necessary condition for alignment is the consideration of complementary benefits between health and consumption, which result in positive interaction terms in MCDA models.

References

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