

# **THE VALUE OF HETEROGENEITY (VoH) FOR COST-EFFECTIVENESS SUBGROUP ANALYSIS**

## **Theoretical framework and application**

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Acknowledgments to Marta Soares<sup>a</sup>

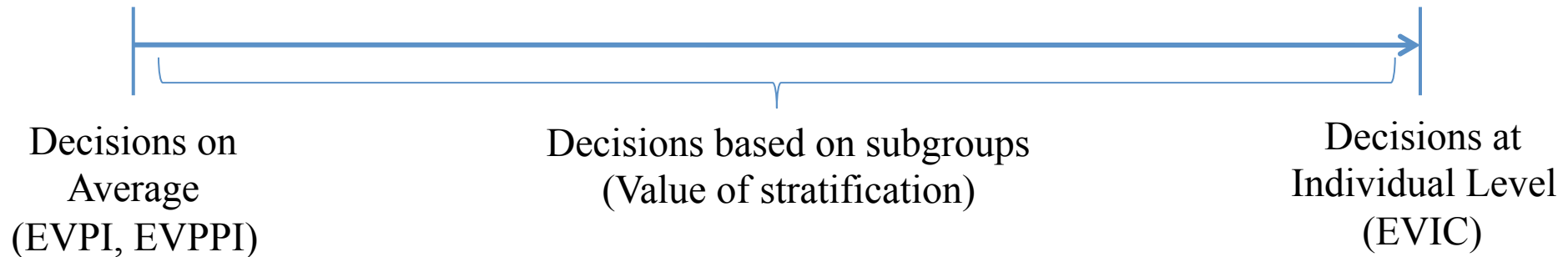
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# Introduction

- Decisions based on *average* measures of cost-effectiveness carry the risk to forego potential benefits for a given subset of the population
- The resource allocation process can be improved when the proportion of the variability that can be explained (heterogeneity) is formally considered in the analysis
- Little guidance in the literature about how to investigate and present the impact of heterogeneity on the cost-effectiveness analysis (CEA) results.
- The aim of this work is to develop an analytical framework to incorporate heterogeneity in the decision making process of a publicly funded national health service

## The Value of Heterogeneity: Dimensions of value in a continuum



- What does the VoH framework adds?:
  - It recognises transaction costs that may hinder the implementation of decisions at individual level
  - It disentangles the static and dynamic value of heterogeneity

Coyle, D., Buxton, M. J. & O'Brien, B. J. 2003. Stratified cost-effectiveness analysis: a framework for establishing efficient limited use criteria. *Health Economics*, 12, 421-7.

Basu, A. & Meltzer, D. 2007. Value of Information on Preference Heterogeneity and Individualized Care. *Med Decis Making*, 27, 112-127.

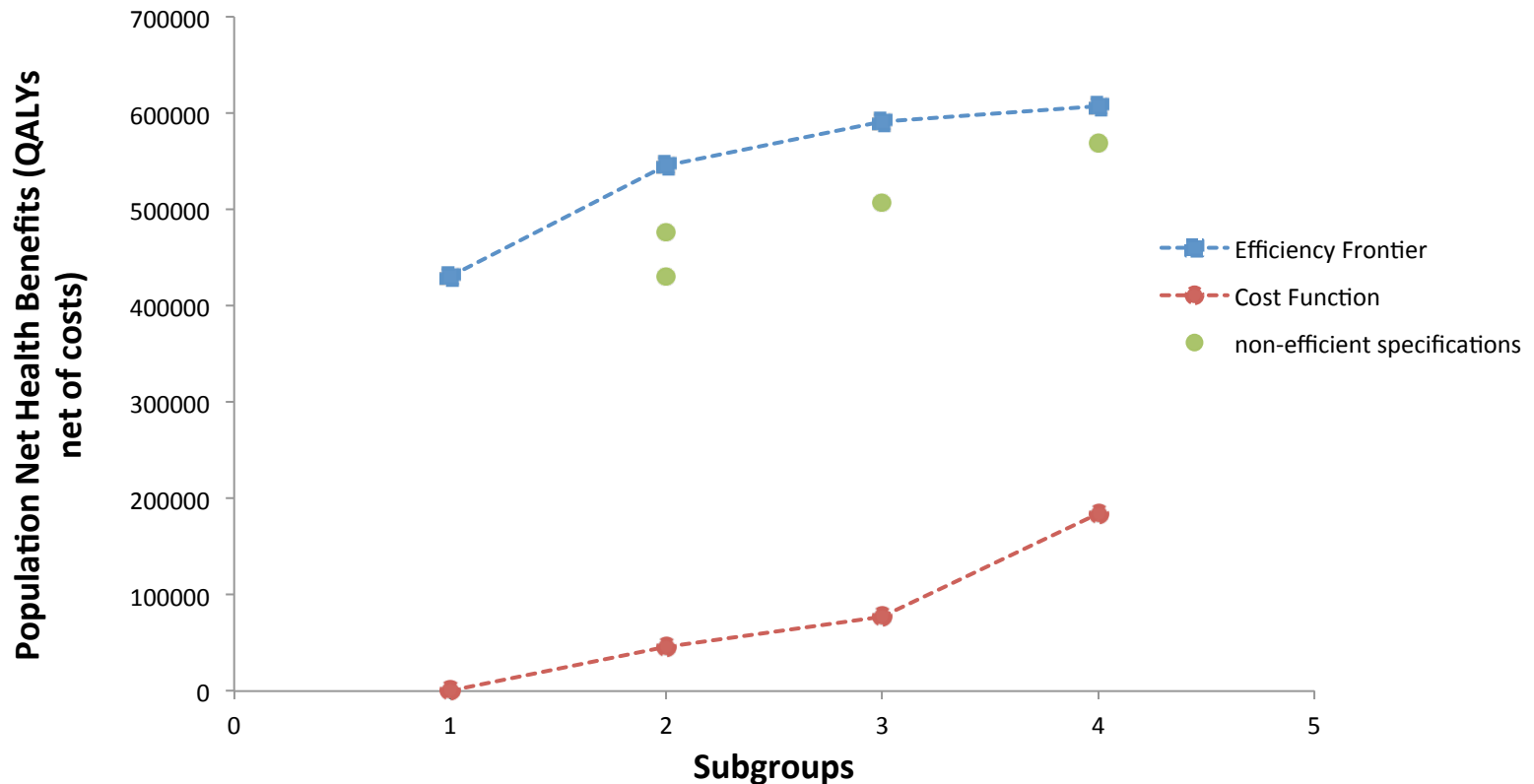
# I. Cost-Effectiveness Subgroup Analysis under Current Information

- Definition of specifications
  - Biological plausibility, ethical and equity concerns, need to be operationalized in practice
- Sources of Heterogeneity
  - Baseline risk, treatment effect, preferences and costs
- Estimation of NB across subgroups
  - Weighted average of NB

$$TNB_s = \sum_{k=1}^K w_k (\max_j NB_K)$$

# I. Cost-Effectiveness Subgroup Analysis under Current Information

- Selection of Subgroups: Efficiency Frontier for subgroup analysis and transaction costs



## II. Decision Uncertainty in Cost-Effectiveness Subgroup Analysis

- Expected net benefit with perfect information for the subgroup  $k$

$$E_{\theta_k} \max_j NB_k(j, \theta_k)$$

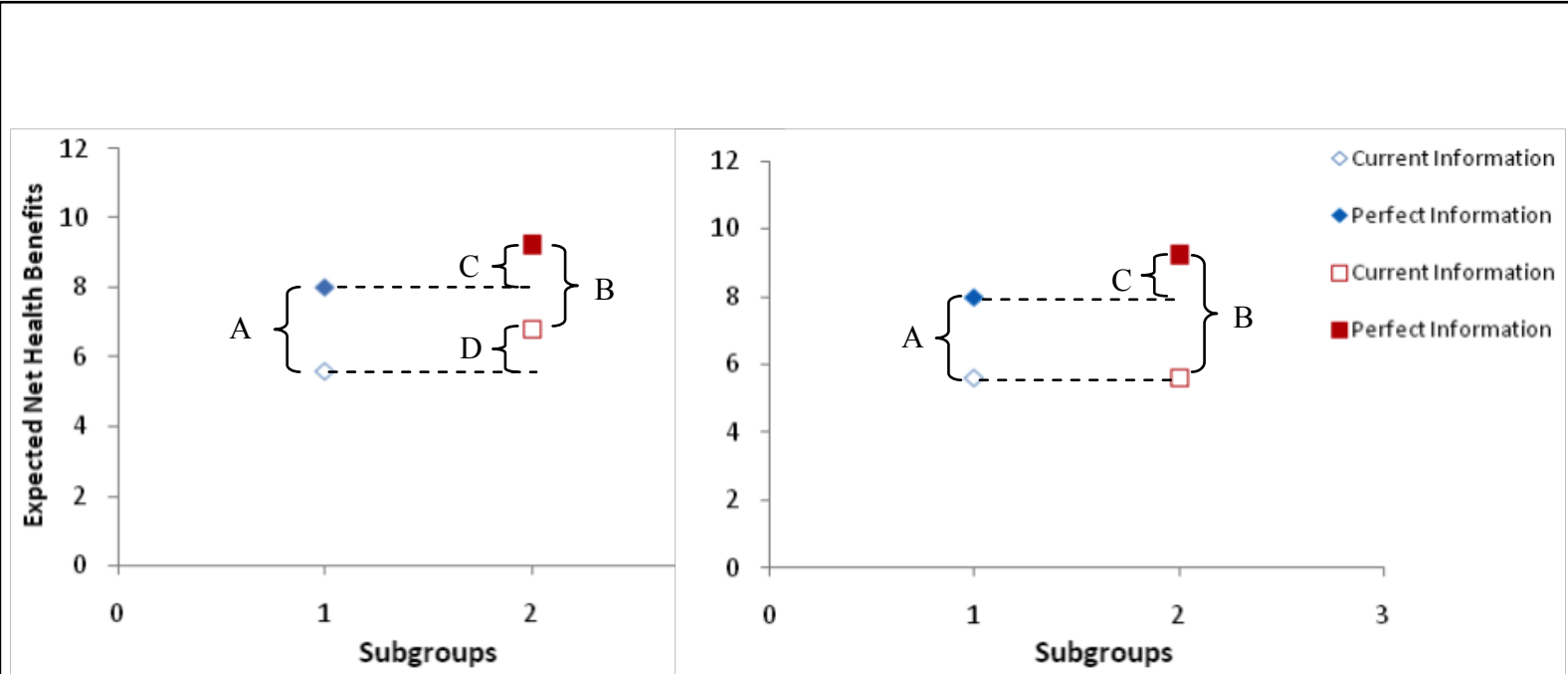
- Expected value of perfect information for a single subgroup ( $EVPI_k$ )

$$EVPI_k = E_{\theta_k} \max_j NB_k(j, \theta_k) - \max_j E_{\theta_k} NB_k(j, \theta_k)$$

- Expected Value of Perfect Information for subgroups ( $EVPI_s$ )

$$EVPI_s = \sum_{k=1}^s EVPI_k w_k$$

# Static and Dynamic VoH

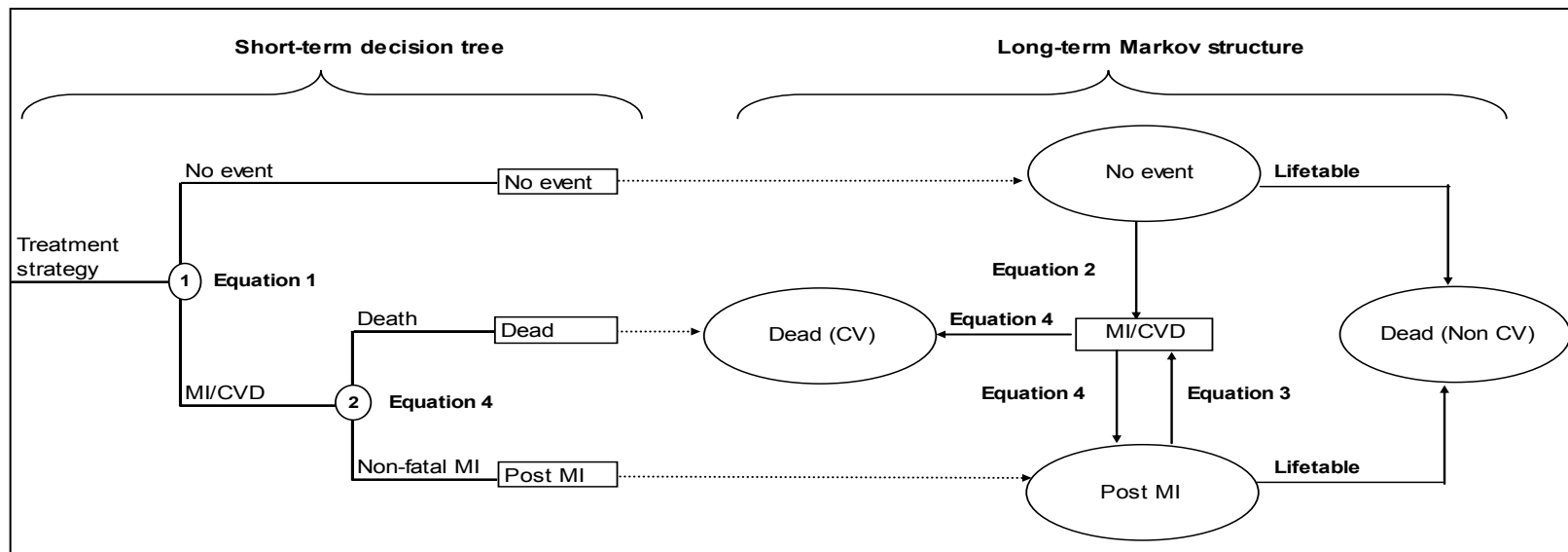


a) Static Value of Heterogeneity

b) Dynamic Value of Heterogeneity

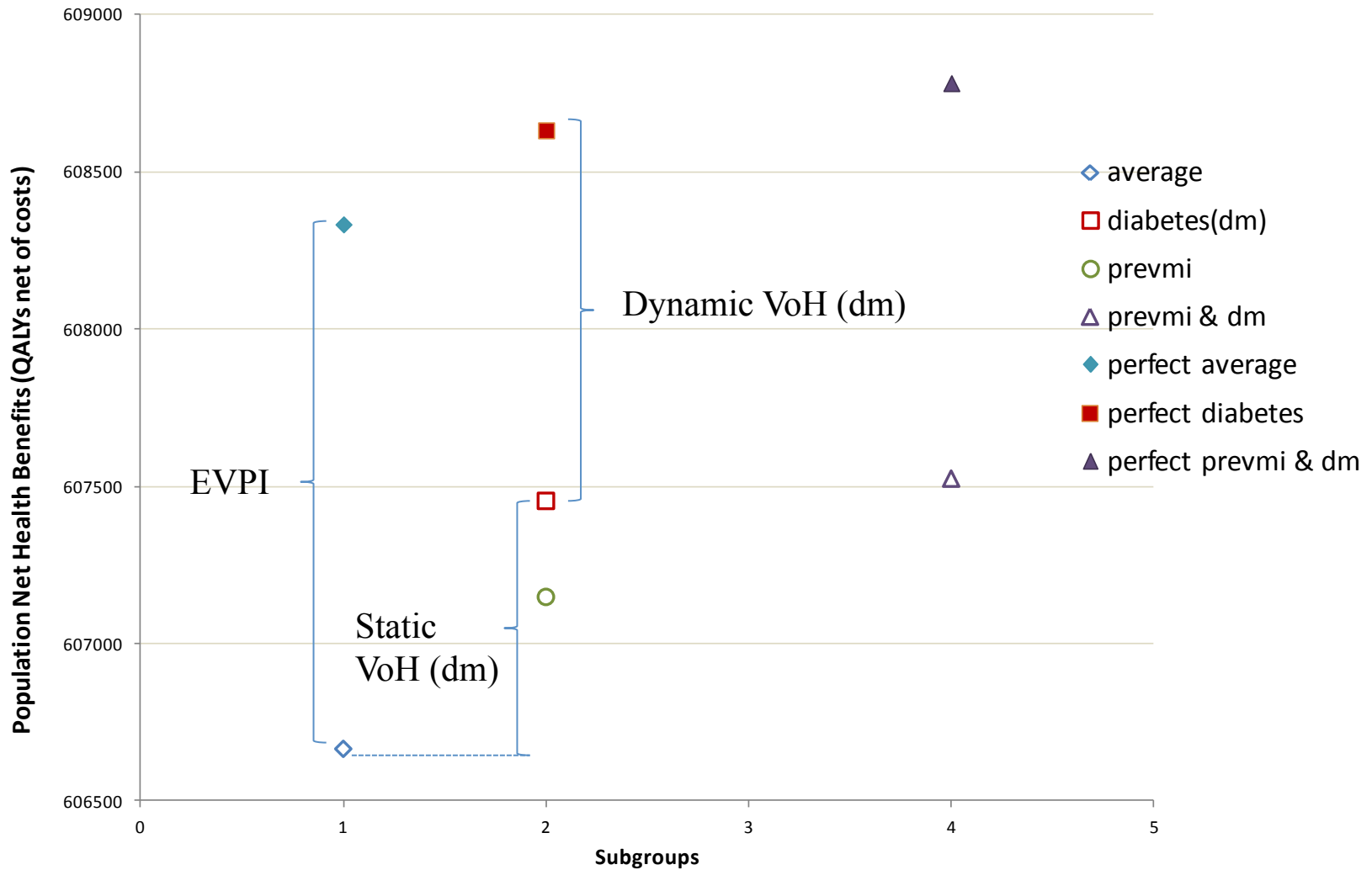
## Motivational example: Trial RITA-3

- Invasive versus conservative strategy for non-ST-elevation acute coronary syndrome (n=1810)



- Invasive strategy was non-cost-effective (ICER=24,741) on average but cost-effective in high risk subgroups

# Cost-effectiveness Subgroup Analysis in RITA-3



# Concluding Remarks

- Heterogeneity analysis on the basis of subgroups is a coherent approach for a collectively funded health system
  - Because it improves efficiency in resource allocation
  - Because it considers transaction costs
- An efficiency criterion should also be considered for subgroup selection
- A systematic subgroup analysis should report two dimensions of value (static and dynamic)