

# **PANEL SESSION: MODELLING HETEROGENEITY IN COST-EFFECTIVENESS ANALYSIS**

## **Modelling variation for decision making**

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## Policy context

- Cost-effectiveness of interventions is subject to variation
- Given an objective of maximising health gain from limited resources, decision making needs to recognise this variation
- Large proportion of decisions of NICE and SMC are 'restricted'
  - Typically when population ICER is  $>$  threshold
  - Should also apply when population ICER  $<$  threshold

# Sources of variation

- Treatment effect
- Baseline event rate
- Prognosis
- Preferences
- Location

# Variation in treatment effect

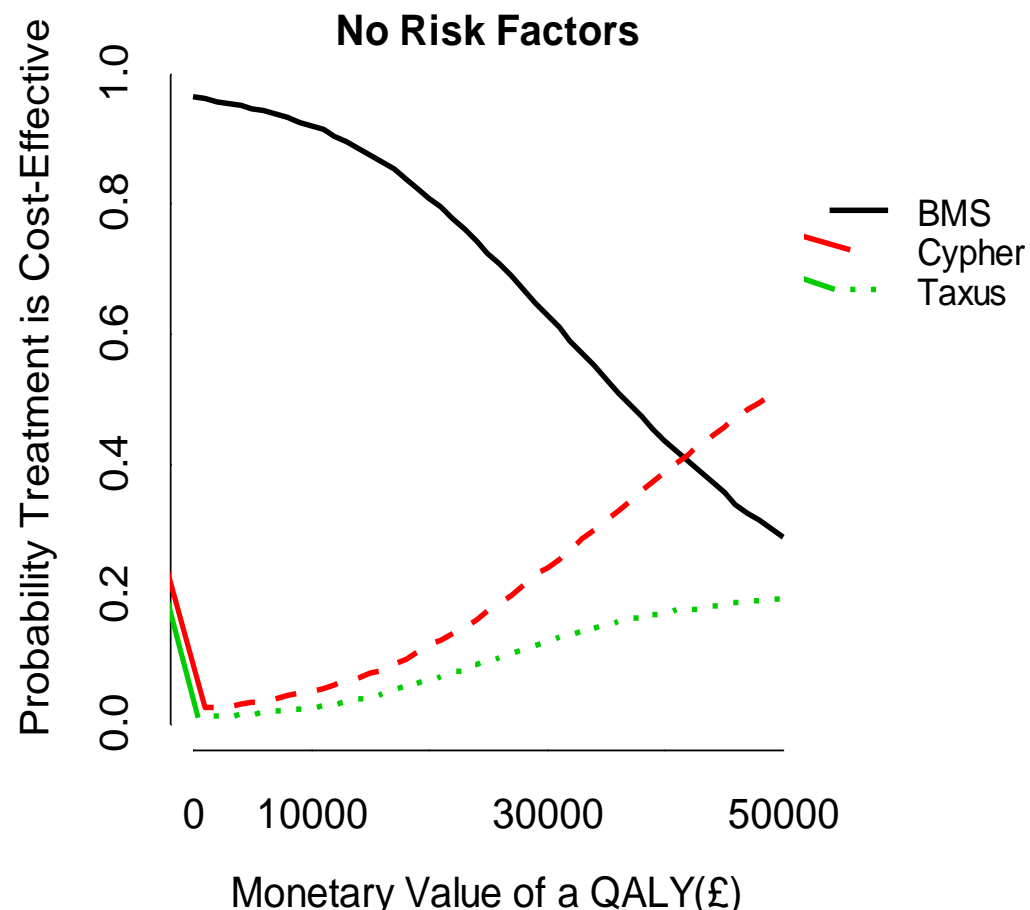
## Example of 2<sup>nd</sup> line therapy for advanced ovarian cancer

Treatment	PFS (wks)	OS (wks)	Quality- adjusted survival (wks)	Cost	ICER <sup>a</sup>	Probability cost-effective for a maximum WTP:		
						£10,000	£30,000	£50,000
<b>Analysis 1 – overall patient population</b>								
Topotecan	24.5	86.0	34.2	£11,394	D	0.00	0.00	0.00
Paclitaxel	20.1	79.7	30.9	£6,354	-	0.31	0.10	0.08
PLDH	27.5	104.8	40.9	£7,714	£7,033	0.69	0.90	0.92
<b>Sensitivity analysis – platinum sensitive</b>								
Topotecan	33.1	101.3	41.7	£11,394	D	0.00	0.00	0.00
Paclitaxel	27.8	104.3	40.9	£6,354	-	0.19	0.10	0.09
PLDH	43.0	145.7	58.4	£7,714	£4,024	0.81	0.90	0.91
<b>Sensitivity analysis – platinum resistant/refractory</b>								
Topotecan	19.8	61.2	25.1	£11,394	D	0.00	0.00	0.03
Paclitaxel	15.2	46.3	19.1	£6,354	-	0.47	0.16	0.12
PLDH	19.8	65.9	26.6	£7,714	£9,465	0.53	0.84	0.85

# Variation in baseline risk

## Example of drug eluting stents (1)

	<i>QALYs</i>			<i>Costs</i>			<i>ICER</i>
	<i>Mean</i>	<i>2.5% CI</i>	<i>97.5% CI</i>	<i>Mean</i>	<i>2.5% CI</i>	<i>97.5% CI</i>	
<b>BMS</b>	-0.01189	-0.0251	-0.00492	1760	1486	2285	
<b>Taxus</b>	-0.0047	-0.01106	-0.00167	2025	1894	2315	Extended Domination
<b>Cypher</b>	-0.00353	-0.00822	-0.00131	2044	1939	2263	33964

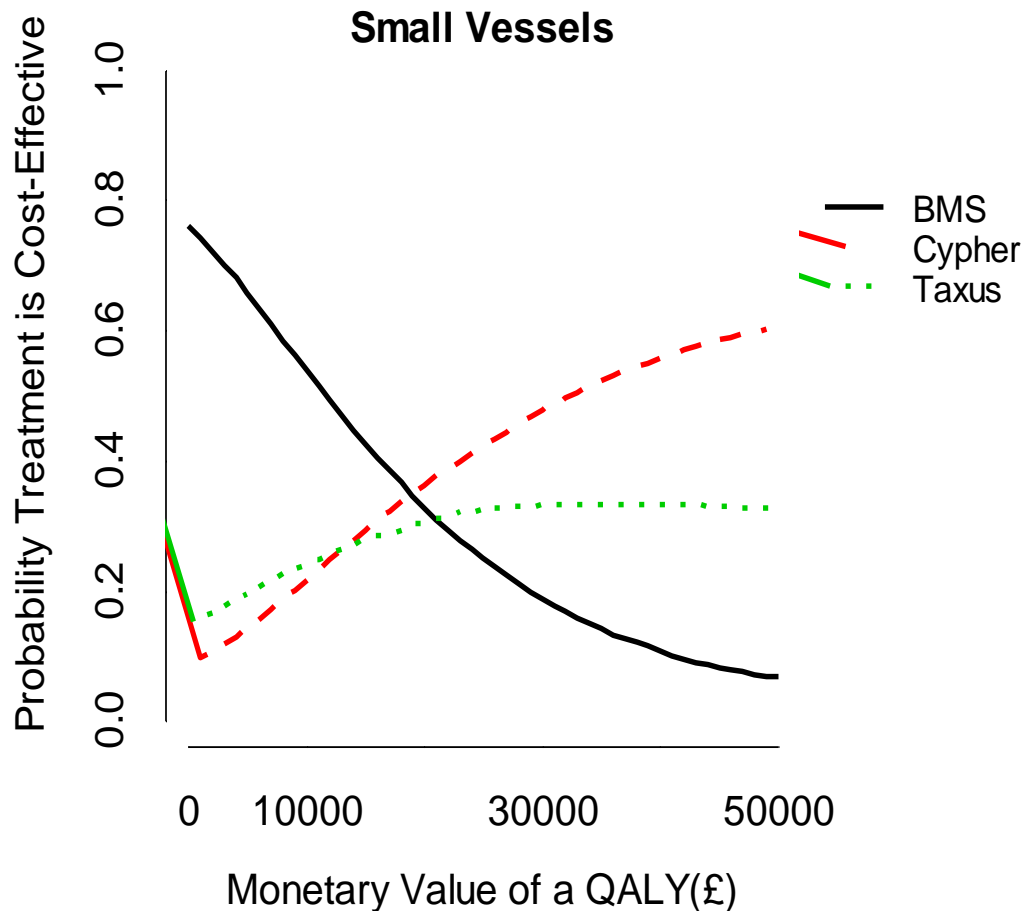


Source: Hawkins *et al.* ISPOR European meeting, Florence, 2005

# Variation in baseline risk

## Example of drug eluting stents (2)

	<i>QALYs</i>			<i>Costs</i>			<i>ICER</i>
	<i>Mean</i>	<i>2.5% CI</i>	<i>97.5% CI</i>	<i>Mean</i>	<i>2.5% CI</i>	<i>97.5% CI</i>	
<b>BMS</b>	-0.01758	-0.03765	-0.00747	2079	1612	3086	
<b>Taxus</b>	-0.00753	-0.01959	-0.00262	2199	1939	2944	Extended Domination
<b>Cypher</b>	-0.00605	-0.01529	-0.00215	2214	1983	2832	11760

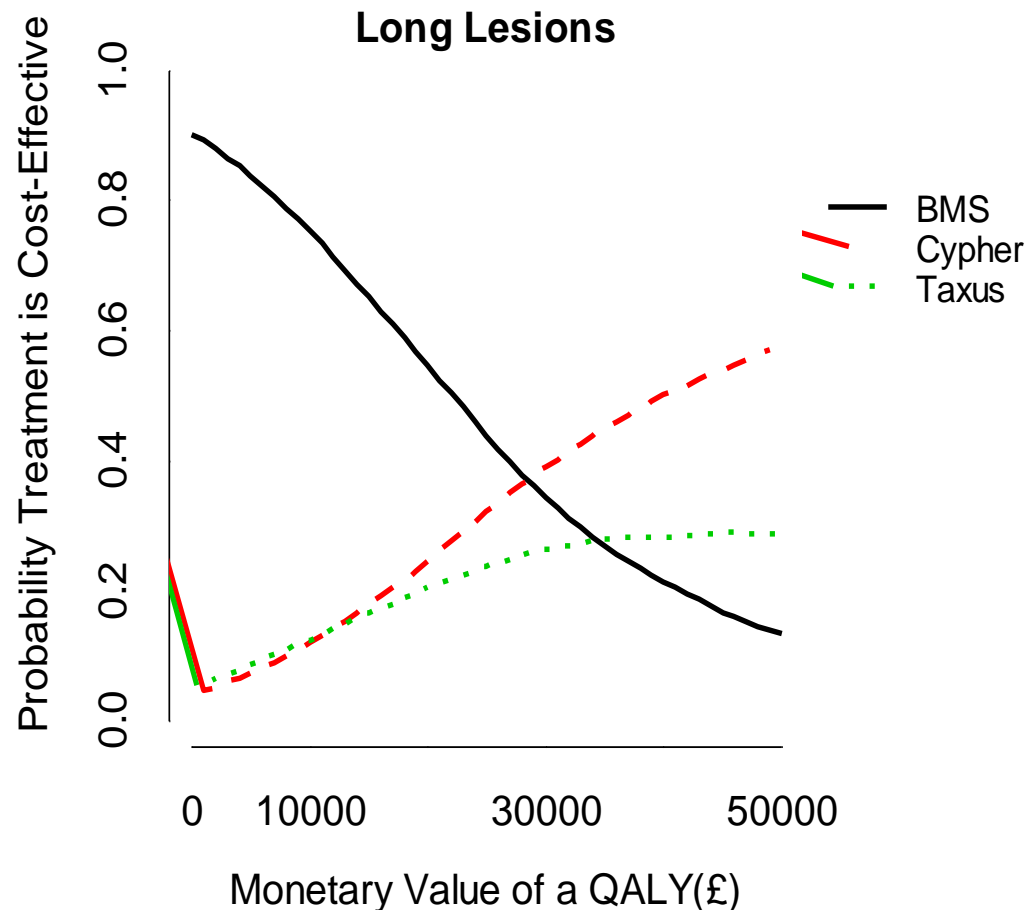


Source: Hawkins *et al.* ISPOR European meeting, Florence, 2005

# Variation in baseline risk

## Example of drug eluting stents (3)

	<i>QALYs</i>			<i>Costs</i>			<i>ICER</i>
	<i>Mean</i>	<i>2.5% CI</i>	<i>97.5% CI</i>	<i>Mean</i>	<i>2.5% CI</i>	<i>97.5% CI</i>	
<b>BMS</b>	-0.01468	-0.0306	-0.00611	1915	1551	2638	
<b>Taxus</b>	-0.00607	-0.0147	-0.0021	2109	1917	2596	Extended Domination
<b>Cypher</b>	-0.00475	-0.01131	-0.00174	2126	1963	2507	21210

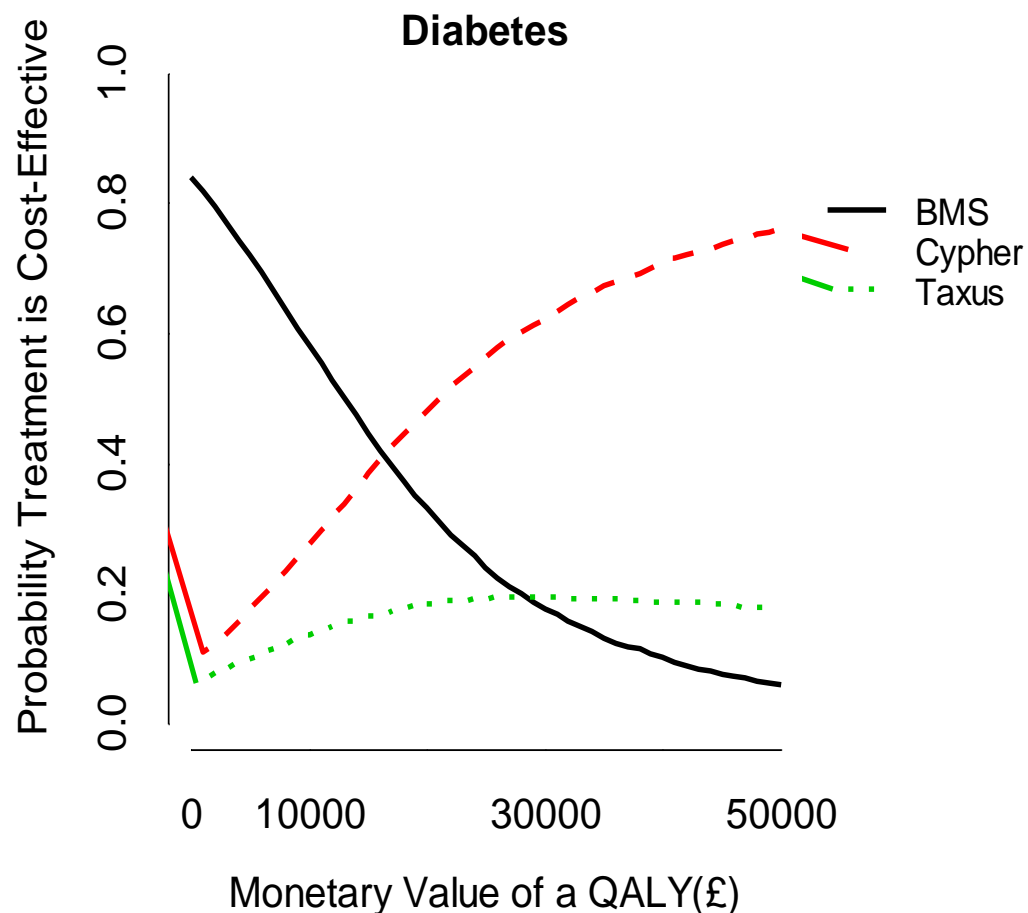


Source: Hawkins *et al.* ISPOR European meeting, Florence, 2005

# Variation in baseline risk

## Example of drug eluting stents (4)

	<i>QALYs</i>			<i>Costs</i>			<i>ICER</i>
	<i>Mean</i>	<i>2.5% CI</i>	<i>97.5% CI</i>	<i>Mean</i>	<i>2.5% CI</i>	<i>97.5% CI</i>	
<b>BMS</b>	-0.01731	-0.03492	-0.00723	1979	1583	2691	
<b>Cypher</b>	-0.00531	-0.01234	-0.00197	2122	1968	2461	11941
<b>Taxus</b>	-0.00706	-0.01668	-0.00246	2123	1927	2535	Dominated



Source: Hawkins *et al.* ISPOR European meeting, Florence, 2005



# Variation in prognosis

## Example of biologic therapy for psoriatic arthritis

Treatment	Mean costs	Mean QALYs	ICER	Probability CE for threshold of:		
				£20,000	£30,000	£40,000
<i>Time horizon 40 years– Males</i>						
Infliximab	£81,679	6.361	D	0.000	0.001	0.013
Etanercept	£60,354	6.433	£16,855	0.742	0.931	0.963
Palliative Care	£17,361	3.882	NA	0.258	0.068	0.024
<i>Time horizon 40 years - Females</i>						
Infliximab	£83,701	6.901	D	0.001	0.003	0.030
Etanercept	£62,459	6.984	£14,806	0.851	0.953	0.956
Palliative Care	£19,538	4.085	NA	0.148	0.044	0.014

Scenario: rebound equal to gain; lifetime time horizon

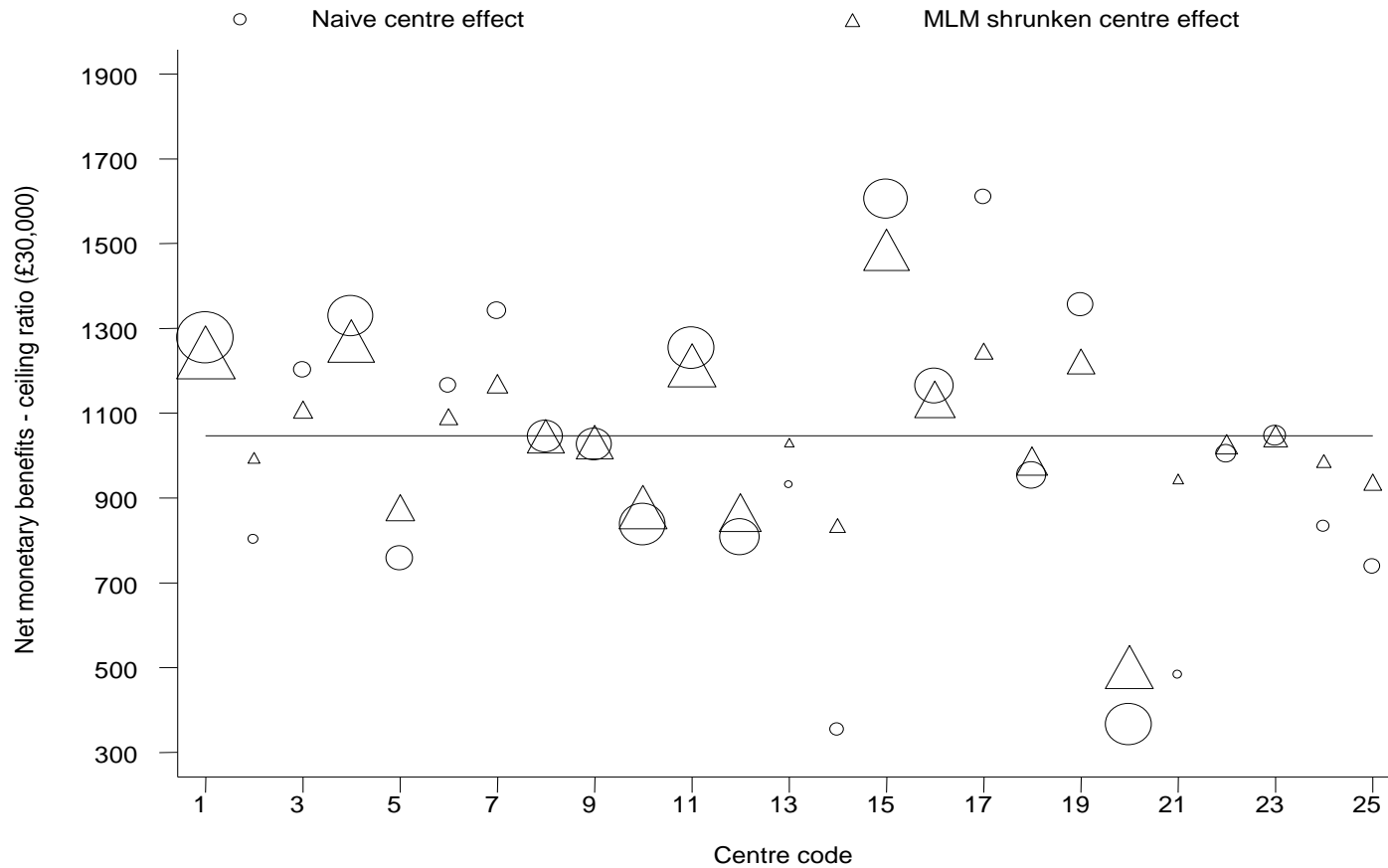
# Variation in patients' preferences

## Example of surgery for menorrhagia

Management strategy	Mean cost per patient (£)	Expected QALYs per patient	Incremental cost per additional QALY (£)
TCRE only	816	14.413	—
Allocation by individualised CEA with threshold ICERs of:			
£6500	1018	15.269	236
£33 000	1076	15.275	9667
AH only	1162	15.195	Dominated

# Variation between locations

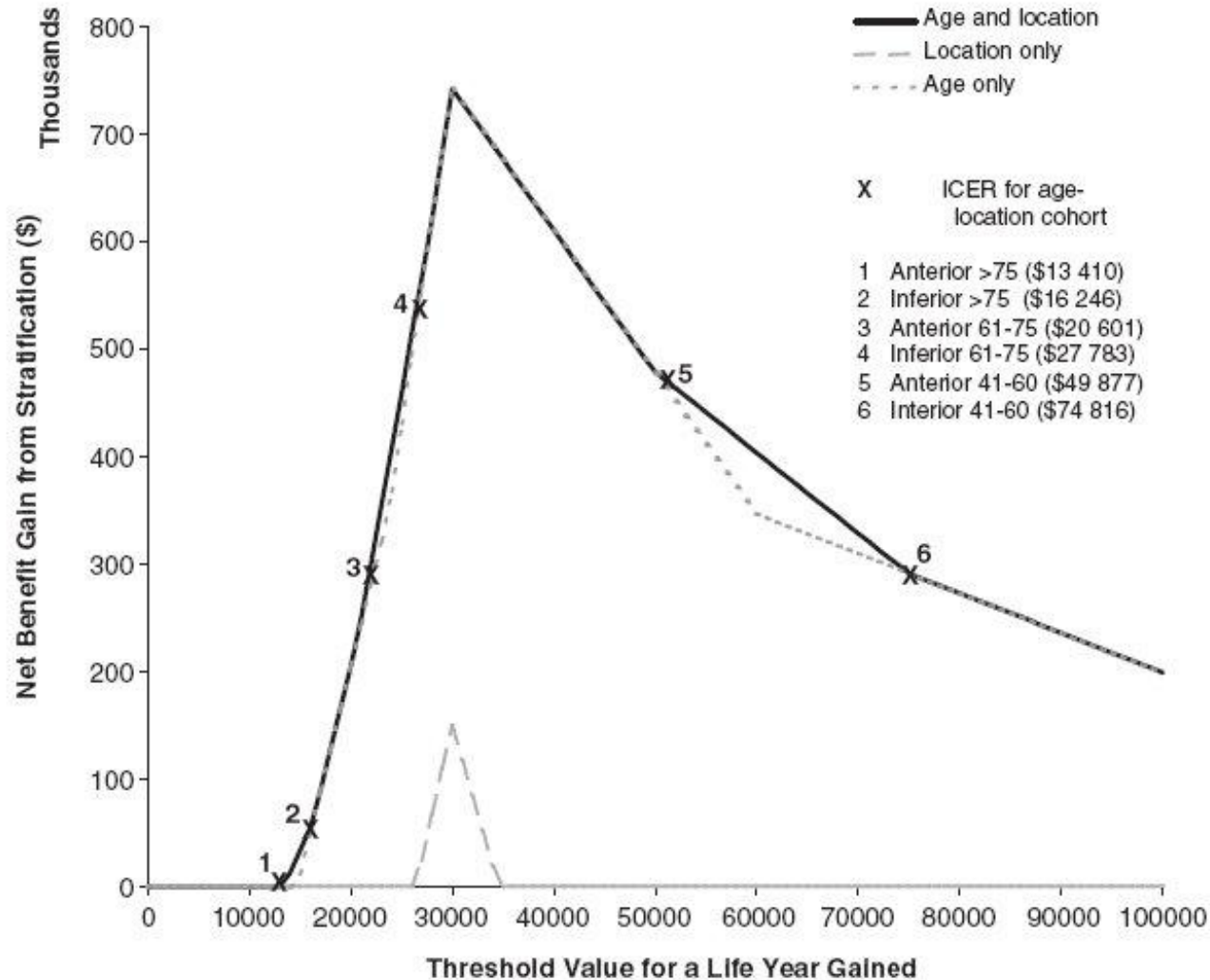
## Example of hysterectomy



Source: Manca *et al.* *Health Economics* 2005;14, pp471-485

# The costs of ignoring variation

## Example from thrombolytics



# Issues in assessing variation (sub-group analysis)

- What are the constraints?
  - Clinical plausibility
  - *A priori* selection (before analysis rather than trial)
- Ethical constraints?
  - On decision making, not analysis
  - Value of presenting costs of equity constraints
- Importance of synthesis and modelling
- Issues of data and precision
  - Statistical significance is not a useful guide
  - But cost of reflecting variation is to increase parameter uncertainty in sub-groups, may effect decision uncertainty
  - Possible implications for value of information