

# *Health Economics for Prescribers*

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# Lecture 3 recap (resources & costs)

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- Identification (checklist 4)
  - Indirect costs
- Measurement (checklist 5)
  - Fixed, variable and total cost
  - Average, marginal and incremental cost (checklist 8)
  - Discounting (checklist 7)
- Valuation (checklist 6)
  - Cost versus price
  - Inflation
  - Sources of unit cost data

# ***‘Drummond’ checklist***

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1. Was a well-defined question posed in answerable form?
2. Was a comprehensive description of alternatives given?
3. Was there evidence that effectiveness had been established?
4. Were all the important and relevant costs and consequences for each alternative identified?
5. Were costs and consequences measured accurately/appropriately?
6. Were costs and consequences valued credibly?
7. Were costs and consequences adjusted for differential timing?
8. Was an incremental analysis performed?
9. Was allowance made for uncertainty?
10. Did presentation/discussion of results include all issues of concern?

# Types of economic evaluation

<i>Type of Analysis</i>	<i>Costs</i>	<i>Consequences</i>	<i>Result</i>
Cost Minimisation	Money	Identical in all respects.	Least cost alternative.
Cost Effectiveness	Money	Different magnitude of a common <b>measure</b> eg., LY's gained, blood pressure reduction.	Cost per unit of consequence eg. cost per LY gained.
Cost Utility	Money	Single or multiple effects not necessarily common. <b>Valued</b> as "utility" eg. QALY	Cost per unit of consequence eg. cost per QALY.
Cost Benefit	Money	As for CUA but <b>valued</b> in money.	Net £ cost: benefit ratio.

# Lecture 4: Pharmaco-economic evaluation – benefits and outcomes

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## ■ Identification

- Mortality, Quality of life etc.
- Cost versus benefit
- Productivity changes

## ■ Measurement

- In natural physical units (eg. number of lives saved)
- Intermediate versus final outcomes

## ■ Valuation *if appropriate*

- Utility (for CUA)
- Money (for CBA)

# 1. Identification

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- Which outcome measure is employed depends on the objective of the evaluation
  - Comparing within treatment area/disease
  - Compare across health service (system)
  - Societal evaluation - health care set against other alternative uses for the resources
- This then determines the type of evaluation
  - Cost-effectiveness analysis (CEA)
  - Cost-utility analysis (CUA)
  - Cost-benefit analysis (CBA)

# Costs versus benefits

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- C/E ratio = *net cost/net* benefits
- *Net cost* = positive cost and negative cost
  - Negative cost = cost saving (eg reduced LoS)
- *Net benefit* = positive benefit and negative benefit
  - Negative benefit = reduced health (eg side-effect)
- Rule of thumb – anything related to resources on cost side, anything related to ‘health’ on benefits

# *Should changes in productivity be included?*

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- Depends upon viewpoint (govt., societal, NHS)
- Main issues are level of 'true' loss/gain and comparability
  - Measurement of value (gross wage, friction cost)
  - Double-counting, especially with CUA/CBA
  - Comparability with 'health' focus (viewpoint again)
  - Comparability with other studies
- Solution?
  - Provide a good reason why they should be included
  - Report separately from other results
  - Differentiate measurement and valuation



## 2. Measurement

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- Measure *effectiveness* not *efficacy*
  - Efficacy = measure of effect under ideal conditions (*can* it work?)
  - Effectiveness = effect under 'real life' conditions (*does* it work?)
  - *Efficacy does not imply effectiveness*
- Measure (count) in natural physical units
  - Number of lives/life years
  - Change in blood pressure
  - Change in cholesterol levels
- Measure *final* not *intermediate* outcomes
  - Intermediate outcomes reflect change in clinical indicators
  - Final outcomes reflect change in health status

# Examples of Intermediate Vs Final Outcomes

<b>Condition being treated</b>	<b>Final outcome indicator</b>	<b>Surrogate</b>	<b>Outcome</b>	<b>Indicators</b>
Coronary thrombosis (thrombolysis)	Quality-adjusted survival	Number surviving	Number with specified level of left ventricular function	Number achieving coronary re-perfusion
Stable angina (various interventions)	Quality-adjusted survival	Number with acceptable quality of life	Number who can walk a specified distance	Number with adequate relief of pain
Asthma (various drugs)	Quality-adjusted survival	Number surviving	Number with adequate control of bronchial hyperreactivity	Number achieving a target level of airways functions
Depression (various drugs)	Quality-adjusted survival	Number avoiding suicide	Quality of life (may be improved by drugs)	Number achieving a target Hamilton or Montgomery-Asberg Depression Rating Scale
Hypertension (various drugs)	Quality-adjusted survival	Number avoiding a stroke	Quality of life (may be worsened by drugs)	Number achieving a target blood pressure

# Sources of effectiveness data

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- Clinical trials, esp RCTs, considered strongest evidence as minimal bias and few confounding factors (takes account of 'unknown unknowns') but
  - often establishes efficacy
  - selective subjects, time horizon etc
- Epidemiological studies, cohort studies, real life setting so establish effectiveness, but
  - potential for bias and numerous confounding factors
  - causal links can be weak and disputed
- Synthesis methods, meta analysis/systematic review, allows for singular insufficient data to be combined, but
  - 'heterogeneity' in observations (apples and pears?)
  - potential biases in searching and reviewing

# Example of cost-effectiveness analysis (CEA)

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- Alternative dosage of lovastatin in secondary prevention of heart disease (Goldman *et al* 1991, JAMA 265: 1145-51)

*Ages 65-74*

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Daily dose	Cost (\$bn)	Life years	Cost/Life year
20 mg.	3.615	348,272	10,400
40 mg.	7.051	477,204	14,800

# Limitations of measurement (i.e. just CEA)

- Ambiguity in assessing overall improvement or decrement in health (addressed by CUA/CBA)

THE WIZARD OF ID

by Brant Parker and Johnny Hart



- Cannot address the issue of allocative efficiency (addressed only by CBA)

# 3. *Valuation*

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- Value is determined by benefits sacrificed elsewhere (see opportunity cost again)
- Valuation requires a trade-off between benefits - measurement does not
- Valuation either in terms of
  - Utility (eg QALY)
  - Money (eg WTP)

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# Example of 'added value' of CUA

- Laser assisted versus standard angioplasty (Sculpher et al, 1996)

	Expected cost	Expected life years	Expected QALYs	Cost per life year gained	Cost per QALY gained
Conventional angioplasty	£3,669	6.7836	5.7846		
Laser-assisted angioplasty	£3,929	6.7908	5.8701	£36,111	£3,041



# Quality-adjusted life years (QALYs)

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- Adjust quantity of life years saved to reflect a valuation of the quality of life
  - If healthy QALY = 1
  - If unhealthy QALY < 1
  - QALY can be <0

# ***QALY procedure***

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- Identify possible health states - cover all important/relevant dimensions of QoL
- Derive utility 'weights' for each state
- Multiply life years (spent in each state) by 'weight' for that state.

# Calculating QALYs example

- **Weights:**
  - Good health = 1
  - moderate health = 0.8
  - poor health = 0.5
- **LYs:**
  - Year 1 + year 2 + year 3 = 3LYs (1+1+1)
- **QALYs:**
  - Year 1(x0.5), year 2(x0.8), year 3(x1) = 2.3 QALYs (0.5+0.8+1)
- **Intervention may increase recovery such that**
  - year 1(x0.8), year 2(x1), year 3(x1) = 2.8 QALYs (0.8+1+1)
- **No difference in LYs but gain in QALYs**

# Utility ‘weight’

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- Utility = satisfaction/ value/ preference
- Utility weights are necessarily subjective
  - Represent individual’s preferences for, or value of, one or more health states.
- Must
  - Have interval properties
  - Be “anchored” at death (0) and good health (1) [can be negative]

# Techniques to 'weight' utility

## Question framing

		<i>Certainty (values)</i>	<i>Uncertainty (utilities)</i>
<b>Response method</b>	<i>Scaling</i>	Rating scale Category scale Visual analogue scale Ratio scale	
	<i>Choice</i>	Time trade-off Paired comparison Equivalence Person trade-off	Standard gamble

# *Choice of technique*

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- Generally values/utilities elicited differ between the techniques, such that  $SG > TTO > RS$
- In general this is also preference order, but choice often contingent on time
- Different generic scales use different scoring techniques (eg EQ-5D=TTO – see later)

# Sources of 'utility' weights 1:

## Evaluation specific

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- Develop evaluation specific description of relevant health state and then derive weight directly by survey using one of the previous techniques
- Advantages
  - Sensitive
  - account for wider QoL (process, duration, prognosis)
- Disadvantages
  - resource intensive
  - lack of comparability

# Sources of 'utility' weights 2: 'Generic'/'multi-attribute' instrument

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- *Predetermined* weights (using one of techniques above) for specified combination of dimensions of health yielding a finite number of health state values
- Advantages
  - Supply weights “off the shelf”
  - Comparable across studies
- Disadvantages
  - insensitive to small changes
  - dimensions may not be sufficiently comprehensive
  - weights may not be transferable across groups



# Generic instrument example: EQ-5D

By placing a tick in one box in each group below, please indicate which statements best describe your own health state today.

## Mobility

- I have no problems in walking about
- I have some problems in walking about
- I am confined to bed

## Self-Care

- I have no problems with self-care
- I have some problems washing or dressing myself
- I am unable to wash or dress myself

## Usual Activities (e.g. work, study, housework, family or leisure activities)

- I have no problems with performing my usual activities
- I have some problems with performing my usual activities
- I am unable to perform my usual activities

## Pain/Discomfort

- I have no pain or discomfort
- I have moderate pain or discomfort
- I have extreme pain or discomfort

## Anxiety/Depression

- I am not anxious or depressed
- I am moderately anxious or depressed
- I am extremely anxious or depressed

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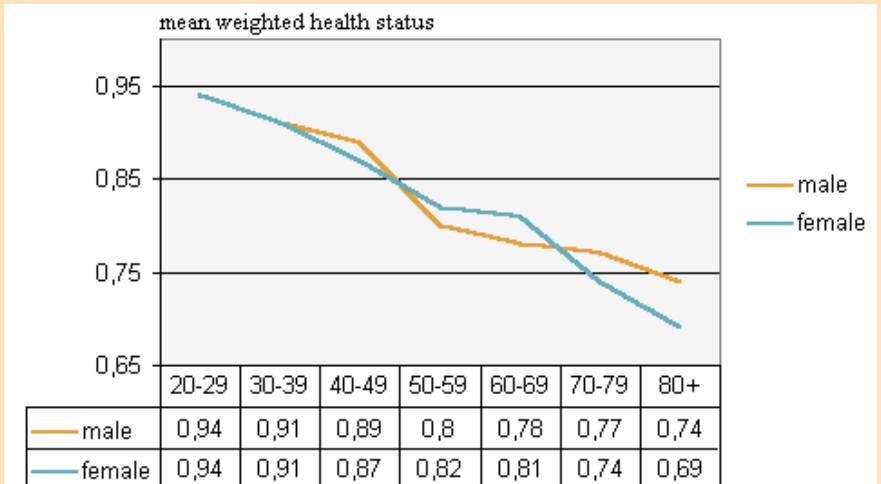
5 dimensions, 3 levels = 245 health states ( $3^5$ )

## Example values:

Health state 11111 = 1.00

Health state 12111 = 0.82

Health state 11223 = 0.26



# Monetary Valuation / CBA

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- CUA still does not address:
  - Allocative efficiency: is health gain ‘worth’ more than benefits those resources could yield elsewhere (health or non-health)?
  - Valuation of **non-health** benefits eg process, information, convenience
  - Valuation of **non-use** benefits ie externalities, option value

# *Methods of Monetary Valuation*

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- Assess individual 'willingness-to-pay' for (the benefits of) a good through either:
- Observed wealth-risk trade-off (revealed preference)
  - Advantage – 'real' preferences/values
  - Disadvantage – difficult control for confounders
- Direct survey (stated preference)
  - Advantage – direct valuation of good
  - Disadvantage – hypothetical/survey problems
- Vast majority of CBA use direct survey

# ***Process of calculating monetary value of benefits using survey WTP***

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- Provide 'scenario' describing benefits and all aspects of 'market' (eg payment vehicle)
- Ask for respondents valuation using specific technique:
  - open-ended question - maximum WTP
  - payment card – chose from range of values
  - closed-ended/binary question
- Calculate mean/median WTP for sample (cf 'price' in competitive market)

# *Simplified WTP question for VPF*

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- Suppose the risk of a car driver being killed in a car accident is 20 in 100,000. You could choose to have a safety feature fitted which would halve the risk of the driver being killed, down to 10 in 100,000.
- What is the most you would be willing to pay to have this safety feature fitted to your car?

# *Simplified WTP calculation*

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- Reduction in risk (dR) = 10 in 100,000
- Mean WTP (dV) = £100
- Implied value of prevented fatality  
(dV/dR) = £1m (£100/0.0001=£1,000,000)
  
- Issues of context – VPF differs for road accident, rail accident, health care etc

# *WTP and ATP (ability to pay)*

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- WTP is (partly) determined by income
  - generally regarded as important factor
  - equal income not a goal in western society
- Can and should it be 'solved'
  - WTP as a % of income
  - requires specification of alternative SWF ie what alternative distribution of income?

# Summary

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- Any evaluation **must** distinguish between identification, measurement and valuation of benefits/ outcomes
- Identification
  - Only non-resource use (cost-savings on cost side of equation)
  - Treat productivity savings carefully
- Measurement
  - Final not intermediate outcomes
  - All that is needed for CEA
- Valuation
  - For CUA expressed as QALYs
  - For CBA expressed as WTP
- Move from CEA→CUA→CBA increases the complexity and difficulty of evaluation so needs justifying