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Improving healthcare decisions

Introduction to Health Economics

Educational Seminar

ISPOR Dubai - September 19, 2018

Introduction to **health economics – Part 1**

Nancy Devlin
Director of Research, Office of Health Economics, London

ISPOR Dubai 2018, United Arab Emirates
September 19th 2018

Office of Health Economics Research

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Improving healthcare decisions

The aim of this session is to give you an understanding of:

- The principal concepts and theoretical foundations of health economics
- The various market failures that can arise in healthcare
- The role of governments in regulating, funding and providing healthcare

In the following session we will introduce the methods of economic evaluation and their use in decision making.

There will be time for Q&A after both sessions.

Health economics

- The application of economic theory, models and empirical techniques to the analysis of decision making by individuals, health care providers and governments with respect to health and health care.
- Economics: a social science; the study of human behaviour when confronted with scarcity
- Health Economics is a sub-discipline of economics, and arguably one of the most impactful e.g., in terms of its influence of economics on policy and practice.

Something as important as health and health care shouldn't involve economics – should it?

"Taking costs into account is unethical"

"**Not** taking costs into account is unethical"

"The word we normally use to describe people who behave without regard to the costs of their actions is not 'ethical' but 'fanatical'"

- Professor Alan Williams

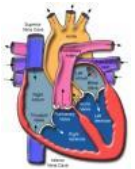
Opportunity cost

- Choices involve weighing up benefits and costs of each option
- Opportunity cost: the benefits from the next best opportunity foregone
- A particularly important principle in consumer choices – but also in decisions about the allocation of health care budgets

One NHS IVF course = £2,700
What is the opportunity cost?

One-third of a cochlear implant

1 heart bypass operation



11 cataract removals

150 vaccinations for Measles, Mumps and Rubella

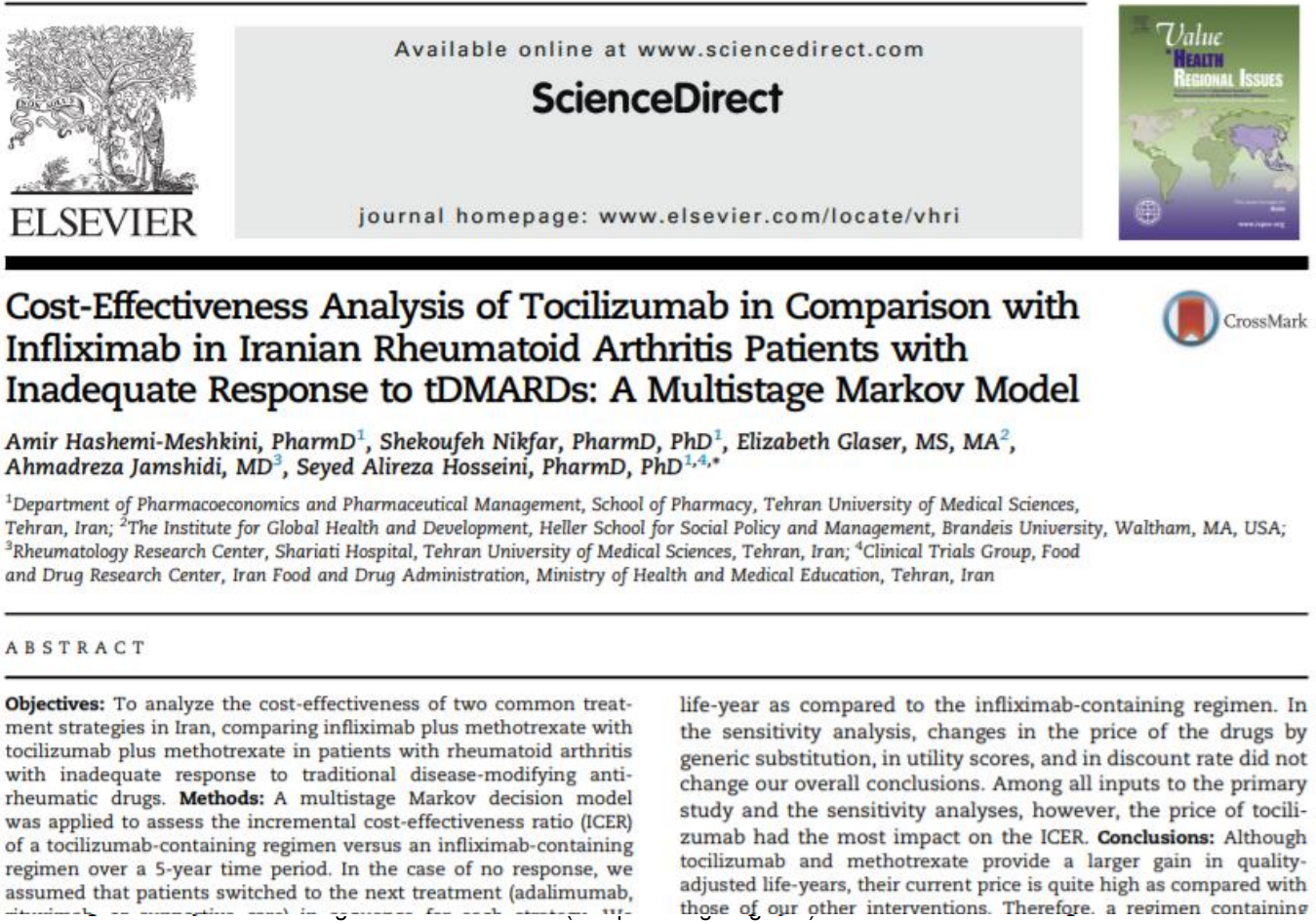
Half a junior school teaching assistant for a year

2000 school dinners

One-thousandth of a Challenger 2 military tank

An overview of the field of health economics

- Health



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journal homepage: www.elsevier.com/locate/vhri

ELSEVIER

Value in Health Regional Issues

Cost-Effectiveness Analysis of Tocilizumab in Comparison with Infliximab in Iranian Rheumatoid Arthritis Patients with Inadequate Response to tDMARDs: A Multistage Markov Model

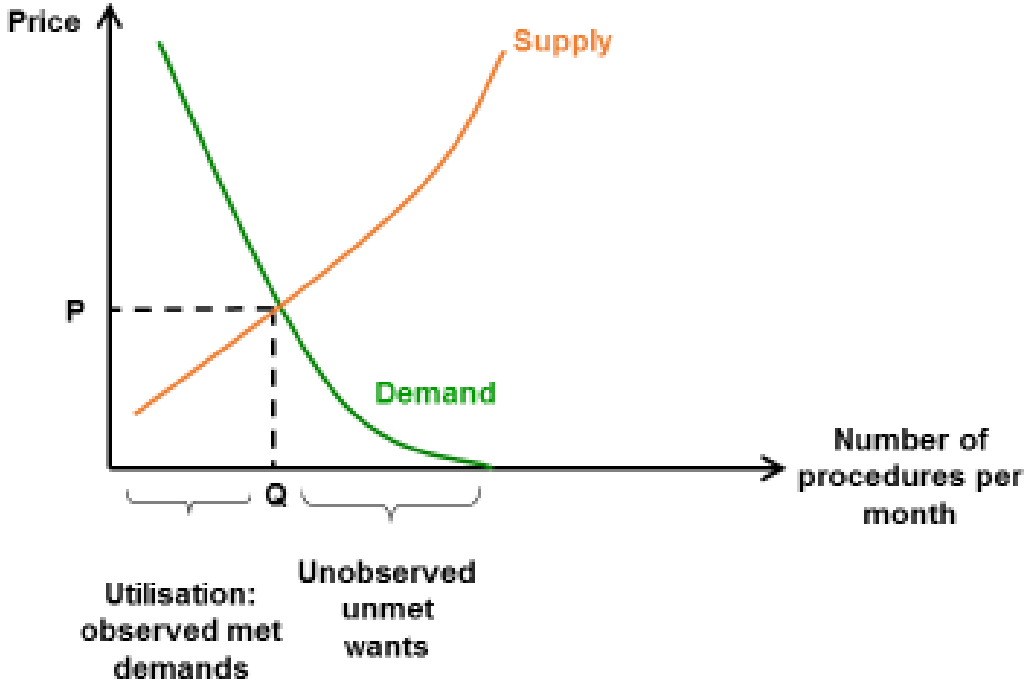
Amir Hashemi-Meshkini, PharmD[1], Shekoufeh Nikfar, PharmD, PhD[1], Elizabeth Glaser, MS, MA[2], Ahmadreza Jamshidi, MD[3], Seyed Alireza Hosseini, PharmD, PhD[1,4,]*

[1]*Department of Pharmacoeconomics and Pharmaceutical Management, School of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran;* [2]*The Institute for Global Health and Development, Heller School for Social Policy and Management, Brandeis University, Waltham, MA, USA;* [3]*Rheumatology Research Center, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran;* [4]*Clinical Trials Group, Food and Drug Research Center, Iran Food and Drug Administration, Ministry of Health and Medical Education, Tehran, Iran*

ABSTRACT

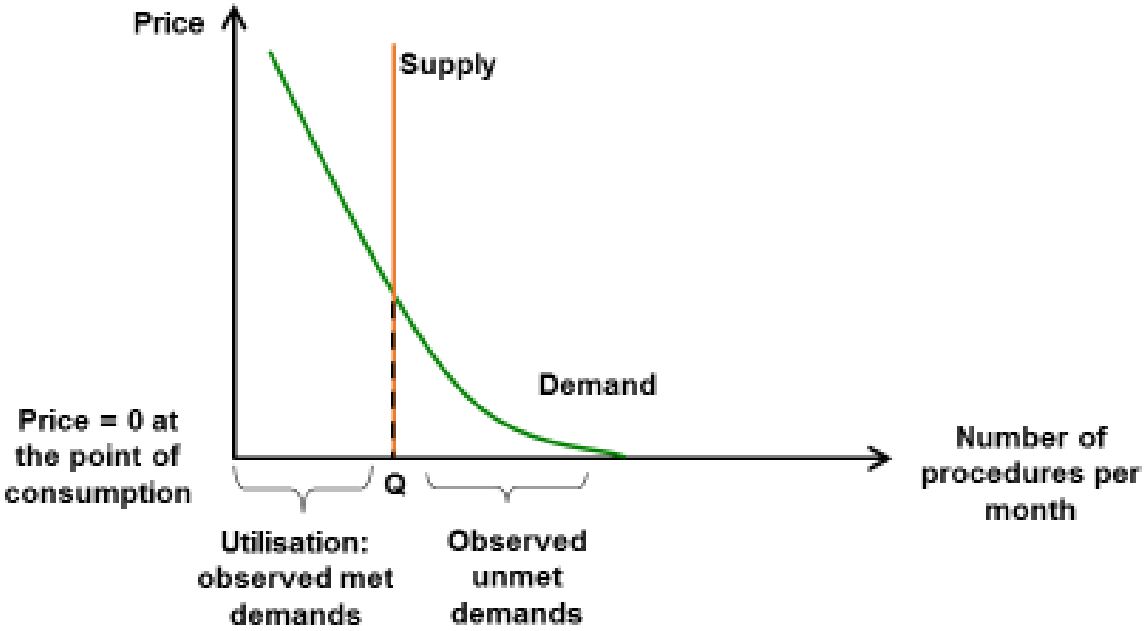
Objectives: To analyze the cost-effectiveness of two common treatment strategies in Iran, comparing infliximab plus methotrexate with tocilizumab plus methotrexate in patients with rheumatoid arthritis with inadequate response to traditional disease-modifying antirheumatic drugs. **Methods:** A multistage Markov decision model was applied to assess the incremental cost-effectiveness ratio (ICER) of a tocilizumab-containing regimen versus an infliximab-containing regimen over a 5-year time period. In the case of no response, we assumed that patients switched to the next treatment (adalimumab, [illegible]) in sequence for each strategy. We life-year as compared to the infliximab-containing regimen. In the sensitivity analysis, changes in the price of the drugs by generic substitution, in utility scores, and in discount rate did not change our overall conclusions. Among all inputs to the primary study and the sensitivity analyses, however, the price of tocilizumab had the most impact on the ICER. **Conclusions:** Although tocilizumab and methotrexate provide a larger gain in quality-adjusted life-years, their current price is quite high as compared with those of our other interventions. Therefore, a regimen containing

Private markets for health care
The demand for and supply of liposuction



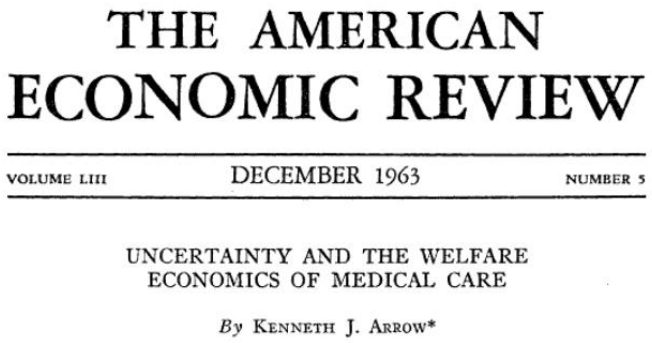
Economic Analysis in Health Care by Morris, Devlin and Parkin

Public markets for health care: a stylised model of demand for and supply of health care in the NHS



Economic Analysis in Health Care by Morris, Devlin and Parkin

Special features of health care and health insurance markets



THE AMERICAN
ECONOMIC REVIEW

VOLUME LIII DECEMBER 1963 NUMBER 5

UNCERTAINTY AND THE WELFARE ECONOMICS OF MEDICAL CARE

By KENNETH J. ARROW*

KJ Arrow (1963)

- Demand = irregular and unpredictable
- Uncertainty
- Asymmetry of information
- Principal-agent relationship with physician
- Barriers to entry

OXFORD REVIEW OF ECONOMIC POLICY, VOL. 5, NO. 1

THE NORMATIVE ECONOMICS OF HEALTH CARE FINANCE AND PROVISION

A. J. CULYER
University of York[1]

I. INTRODUCTION

Whereas in many countries the 'crisis' in medical care has been seen in terms of 'excess' spending on health services, in the UK it has been seen (at least by most of those who manage and work in the NHS) as a crisis of 'underfunding'. This has come about

insurance, private finance of other kinds (such as out-of-pocket payments), and private provision of health care itself.

Few of these contributions have been informed by the work of health economists, particularly their normative work. There have been several reviews

AJ Culyer (1989)

Market failure and the role of government in health care

Market imperfections may lead to inefficient or inequitable distribution of resources.

- Imperfect consumer information
- Monopoly
- Externalities

➔ Government intervenes to restore efficiency and/or equity.

- *“Public interest theory.”*

An opposing theory: The amount and types of government intervention are determined by supply and demand.

- Vote-maximizing politicians “supply” legislation.
- Wealth maximizing special interest groups are the buyers.

➔ Successful politicians stay in office by satisfying special interest groups.

- *“special interest group theory”*

Special interest group theory claims that special interest groups gain at the expense of the general public.

- The special interest group is well organized and motivated to pursue (eg via lobbying) their own interests
- Consumers are diverse, fragmented, more costly for them to organize.

➔Inefficient, inequitable resource allocation by government.

- Which theory do you believe?
- Cost Benefit Analysis (CBA) has an important role in ensuring govt. intervention is evidence-based

Public Goods

- >1 individual simultaneously receives benefits from the good.

  i.e., no rivalry in consumption.

- Costly (or impossible) to exclude non-payers from consumption of the good.

➔ Private firms unwilling to produce and sell public goods.

- Are most medical services public goods?

Negative externalities

Definition: An unpriced by-product of production or consumption that adversely affects another party not directly involved in the market transaction.

- Cigarette smoking
- Pollution
- Medical treatment for cyclists who don’t wear helmets
- Drunk drivers

Types of Government Intervention & examples

- Provide public goods.
- Correct for externalities
- Regulate markets
- Enforce antitrust laws.
- Funding health care
- Provide health care

- Fund medical research
- Tax cigarettes
- Vaccinations
- Pharmaceutical product Licensing
- Patents
- Competition and markets
- The NHS
- Public hospitals

Mixed health care economies

	FUNDING		
PROVISION	**public**	**private**	**mixed**
public	fully public health care system		ded
private	eg. fully subsidised visits to self-employed GPs	eg. private ins… plus user fees; privat… not-for-pro… pro…	
mixed	e.g. fully subsidised care, but contestable provision markets		

How big is the problem of moral hazard in public systems? Can it be avoid… Can…

Why is private health care provision dominated by not-for-profits?

provic… mor… efficient than public providers?

payme… equity… objectives?

- Even in predominantly private systems, there is a… …ment in regulation e.g., licensing medical practitioners.

Health spending

Total / Government/compulsory / Voluntary, US dollars/capita, 2017 or latest available

Source: Health expenditure and financing: Health expenditure indicators

Show: Chart | Table

fullscreen | share | download ▾ | My pinboard ▾

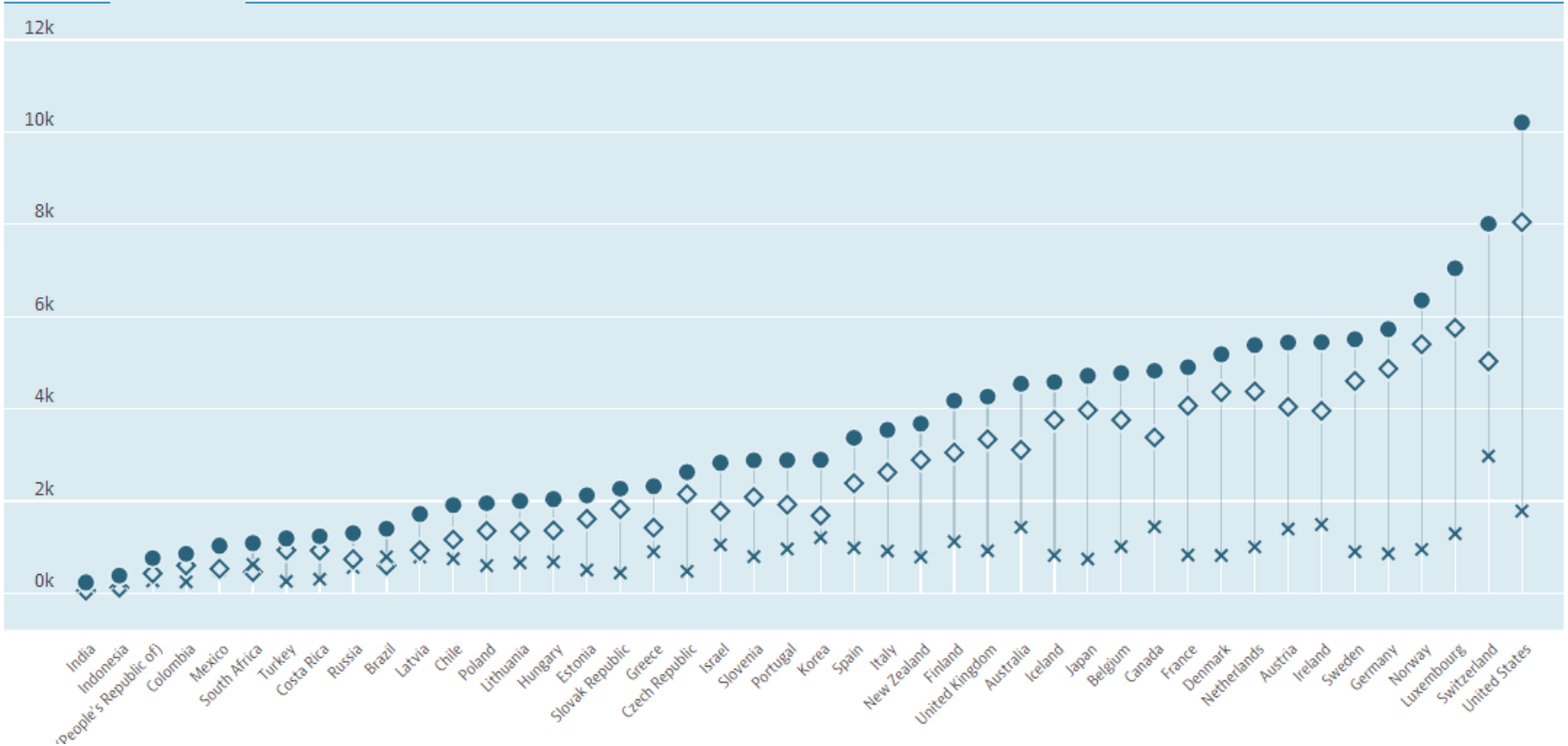


Table 2 Annual per capita total health expenditure by country in International Dollars (purchasing power parity)

Country	2000	2014	AAGR[a] 2000–2014
Algeria	278	932	9.0
Bahrain	1256	2273	4.3
Egypt	325	594	4.4
Iraq	67[b]	667	17.8
Jordan	593	798	2.1
Kuwait	1478	2320	3.3
Lebanon	1061	987	−0.5
Libya	699	806	1.0
Morocco	147	447	8.3
Oman	1081	1442	2.1
Qatar	1929	3071	3.4
Saudi Arabia	1186	2466	5.4
Sudan	75	282	9.9
Syrian Arab Republic	157	376	6.4
Tunisia	314	785	6.8
United Arab Emirates	2034	2405	1.2
Yemen	146	202	2.4

Source of data: [16]
[a]*AAGR* average annual growth rate (%)
[b]data is for 2003

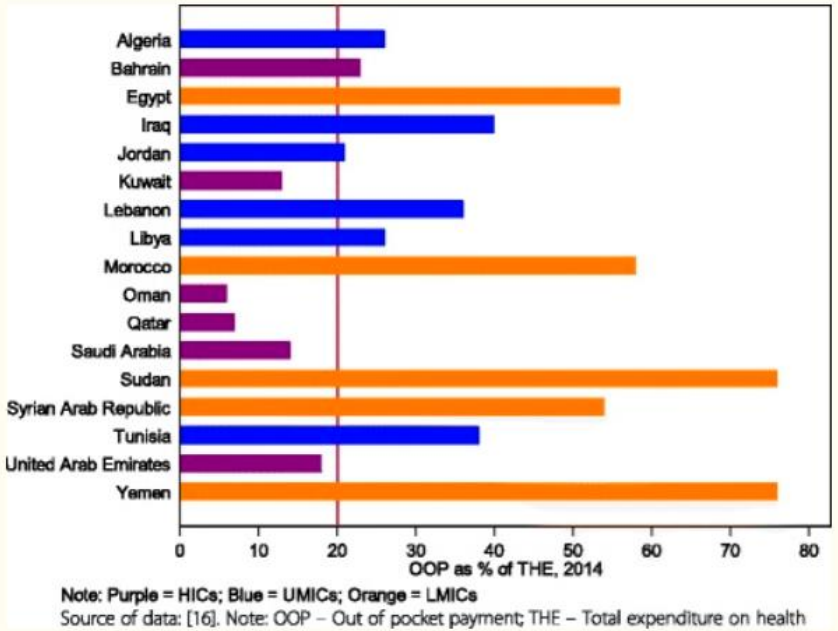
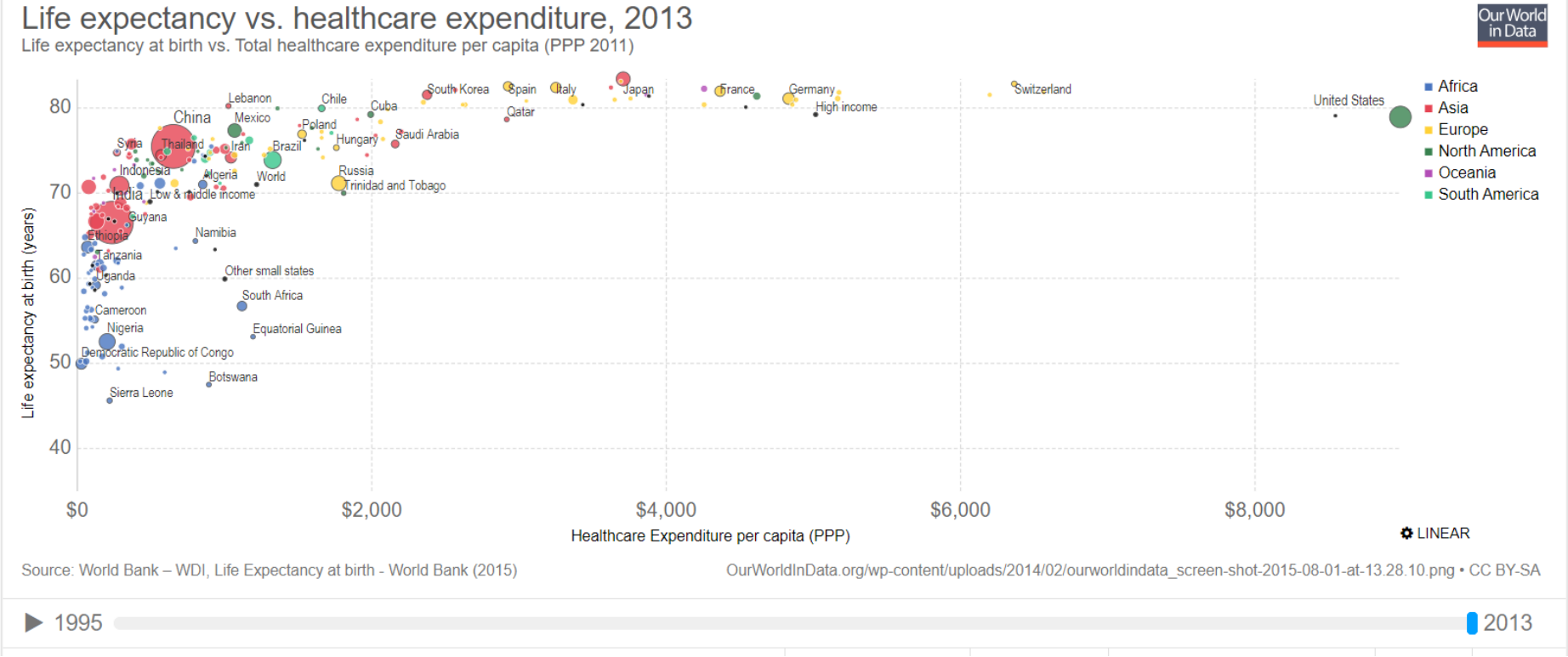


Fig. 6

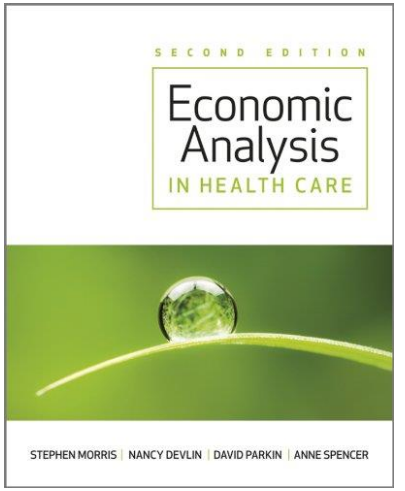
Out of pocket payment as a percentage of total health expenditure, 2014, by country

Asbu et al (2017)
https://ghrp.biomedcentral.com/track/pdf/10.1186/s41256-017-0044-9

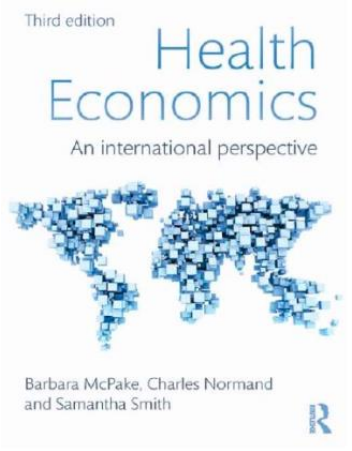

Life expectancy vs. healthcare expenditure, 2013
Life expectancy at birth vs. Total healthcare expenditure per capita (PPP 2011)
Our World in Data
Life expectancy at birth (years)
80
70
60
50
40
$0
$2,000
$4,000
$6,000
$8,000
Healthcare Expenditure per capita (PPP)
LINEAR
Africa
Asia
Europe
North America
Oceania
South America
China
India
United States
Indonesia
Brazil
Russia
Japan
Germany
France
Switzerland
South Korea
Spain
Italy
Mexico
Thailand
Iran
Nigeria
Ethiopia
Tanzania
Uganda
Cameroon
Democratic Republic of Congo
Sierra Leone
Botswana
South Africa
Equatorial Guinea
Namibia
Guyana
Trinidad and Tobago
Saudi Arabia
Qatar
Hungary
Poland
Cuba
Chile
Lebanon
Syria
Algeria
World
Low & middle income
High income
Other small states
Source: World Bank – WDI, Life Expectancy at birth - World Bank (2015)
OurWorldInData.org/wp-content/uploads/2014/02/ourworldindata_screen-shot-2015-08-01-at-13.28.10.png • CC BY-SA
1995
2013

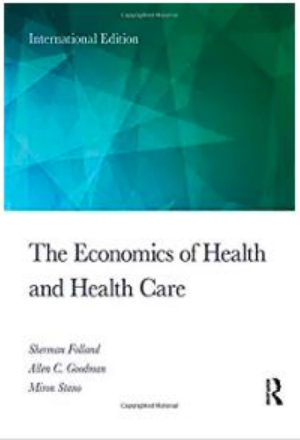
Recommended resources

Morris, Devlin, Parkin & Spencer (2013) *Economic analysis of health care* (2nd edition), Wiley.



Folland, Goodman, Stano (2017) The Economics of health and health care. (8th edition) Routledge.





McPake, Normand, Smith (2013) Health Economics: An International Perspective. Routledge.

SECTION

1

Q&A Session

Introduction **to the methods of economic evaluation and use in allocating resources – Part 2**

Nancy Devlin
Director of Research, Office of Health Economics, London

ISPOR Dubai 2018, United Arab Emirates
September 19th 2018

Office of Health Economics Research

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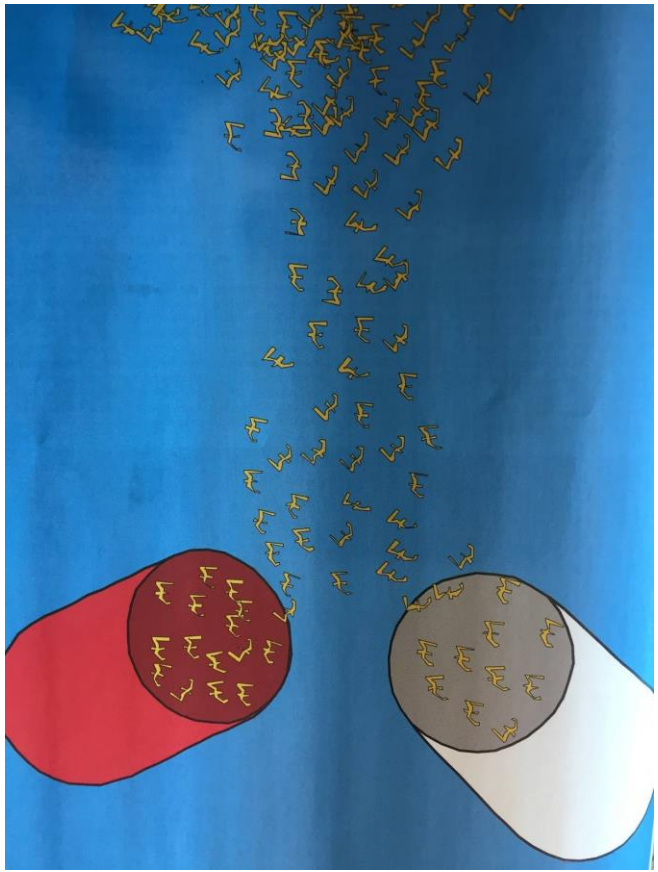
Improving healthcare decisions

The aims of this session are to:

- Provide you with an understanding of the principles that underpin economic evaluation in heath care
- Familiarise you with the main methods of economic evaluation
- To consider how these can be used to inform decisions concerning the allocation of resources
- To highlight some remaining issues concerning the use of these methods and what ‘value’ means in health care.

Contents

1. Principles: efficiency, opportunity cost, marginal analysis
2. Methods: cost benefit analysis, cost effectiveness analysis
3. QALYs and patient reported outcomes
4. Judging value for money: cost effectiveness thresholds
5. The future of economic evaluation of health care



1. Key principles that underpin economic evaluation in health care

Before we start:

- We need to know how *effective* health care services are (to what extent do they improve patient health?)
- We need to ensure that the way they are produced avoids waste/costs are minimised (*technical* efficiency)

How do we allocate resources *between* services?

Allocative efficiency = maximising the achievement of aims from the available budget

- From any available budget, a decision to fund one treatment has an opportunity cost of the benefits foregone from the next best treatment.
- So we need to be able to 'weigh up' health gained versus health foregone from any given decision.

Economists focus ‘on the margin’: a worked example of the importance of marginal analysis

The Government says that it will earmark a sum for the prevention of two diseases (Disease A and Disease B) that are prevalent in your country. These diseases are sometimes fatal, but can be prevented by suitable procedures.

You are asked to advise on how to spend the money to maximise the number of premature deaths averted.

The Government hints that the sum will be $1 billion.

You ask public health experts, who tell you that the number of premature deaths averted by spending $1 billion would be:

49 for disease A ***or*** **101 for disease B**

What would you advise?

Disease B?

The Government now tells you that, because of a change in the budget, the sum will actually be $500m.

Again you ask public health experts, who tell you that the number of premature deaths averted by spending $500m would be

39 for disease A ***or*** **81 for disease B**

What would you now advise?

still Disease B?

Documents on this decision, including your advice, are debated by government.

The Government announces publicly that they will, after all, make $1 billion available.

What would you now advise about how to spend that budget?

Is your answer still Disease B? Why/why not?

	Deaths averted			Average Cost	
	A	B	Total	A	B
$1b	49	101	101	£20,408	£9,901
$500 m	39	81	81	£12,821	£6,173
$1b	39	81	120	£12,821	£6,173

You get better 'value for money' from spending half on Disease B and half on Disease A.

Total deaths avoided = 120, which is more than the deaths avoided by spending all the money on B.

	Disease A		Disease B	
Total cost (£)	Deaths averted	Average cost per death averted	Deaths averted	Average cost per death averted
100 000	10	10 000	26	3 846
200 000	19	10 526	43	4 651
300 000	27	11 111	58	5 172
400 000	34	11 765	70	5 714
500 000	39	12 821	81	6 173
600 000	43	13 953	87	6 897
700 000	46	15 217	92	7 609
800 000	48	16 667	96	8 333
900 000	49	18 367	99	9 091
1 000 000	49	20 408	101	9 901

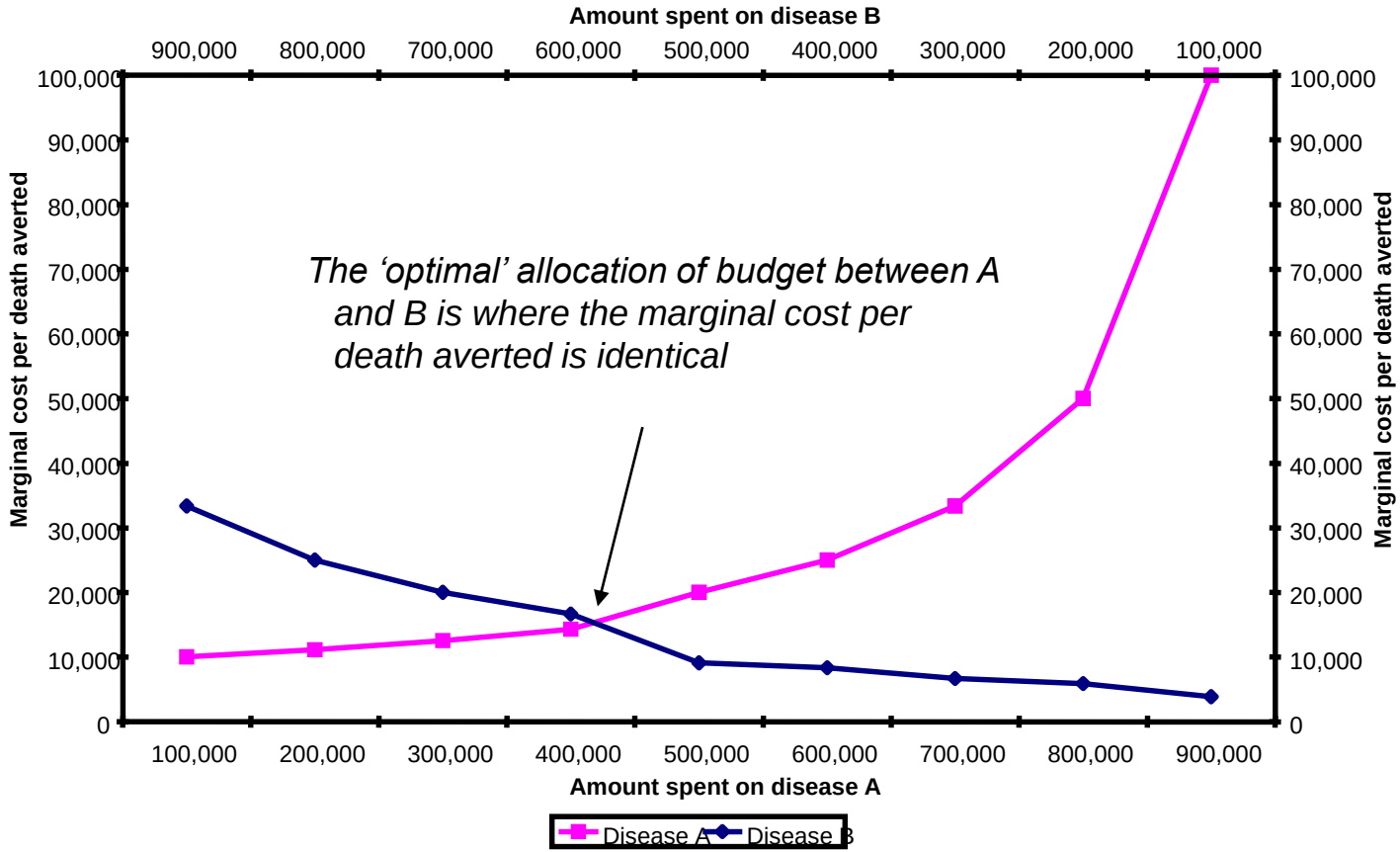
But oddly, the 'average cost per death avoided' is always lower for B than A. If you focused just on these 'averages' you would never choose to spend money on A.

Cost		A			B		
Total	Marginal	Total	Marginal	MC	Total	Marginal	MC
£0.5m	£0.5m	39	39	£12,821	81	81	£6,173
£1m	£0.5m	49	10	£50,000	101	20	£25,000

MC = Marginal cost per death averted

The reason is because we need to look at what is happening 'at the margin'.
Once you've already spent $500m on B, the MC of spending another $500m on B is greater than the MC of spending $500m on A.

	Disease A		Disease B	
Total cost (£)	Deaths averted	Marginal cost per death averted	Deaths averted	Marginal cost per death averted
100 000	10	10 000	26	3 846
200 000	19	11 111	43	5 882
300 000	27	12 500	58	6 667
400 000	34	14 286	70	8 333
500 000	39	20 000	81	9 091
600 000	43	25 000	87	16 667
700 000	46	33 333	92	20 000
800 000	48	50 000	96	25 000
900 000	49	100 000	99	33 333
1 000 000	49	∞	101	50 000


Amount spent on disease B
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Marginal cost per death averted
The 'optimal' allocation of budget between A and B is where the marginal cost per death averted is identical
100,000
200,000
300,000
400,000
500,000
600,000
700,000
800,000
900,000
Amount spent on disease A
Disease A
Disease B

Importance of Marginal Cost and marginal benefit - Case of Detecting Colon Cancer

No of Tests	Total Cases Detected	Additional cases Detected	Total Cost	Average Cost per Case	Marginal Cost per Case
1	65.9469	65.9469	77,511	1,175	1,175
2	71.4424	5.4956	107,690	1,507	5,492
3	71.9004	0.4580	130,111	1,810	49,150
4	71.9385	0.0382	148,116	2,059	469,534
5	71.9417	0.0032	163,141	2,268	4,724,695
6	71.9420	0.0003	176,331	2,451	47,107,214

What should our measure of benefit be?

In the examples shown, these were
(a) deaths avoided
(b) cases of colon cancer detected.

But in (a)
- This could have been ‘years of life saved’.
- what about the quality of life for those lives?

And in (b)
- What happens when cancer is detected? Are treatments available? Are they effective at prolonging life/improving quality of life?

2. The main methods of economic evaluation

method	How are costs measured?	How are benefits measured?	Theoretical foundations
Cost benefit analysis (CBA)	money	Money • Shadow pricing • Stated preferences	Applied Welfare Economics
Cost effectiveness analysis (CEA)	money	'Natural units' eg. per death averted	
Cost consequences analysis	money	Multiple units of outcomes simultaneously considered	
Cost utility analysis (CUA)	money	Quality adjusted life years (QALYs)	Associated with Extra Welfarism

3. Quality Adjusted Life Years (QALYs)

- Incorporates both quality and length of life.
- Quality of life is used to 'weight' length of life, where:
  - 1 = full health, 0 = dead, < 0 'worse than being dead'
- 1 QALY = a year of perfect health
- Can capture changes in quality of life, length of life or both

Before: 20 years x 0.5 = 10 QALYs
After: 20 years x 0.9 = 18 QALYs → Δ QALYs = (18-10) = 8

In practice, complex economic models are used to describe probabilities of experiencing a given state, transitions between states, side effects, probability of adverse outcomes/treatment failures, etc.

- In cost utility analysis, the incremental cost effectiveness ratio

ICER = Δ cost /Δ QALYs

Measuring QoL via patient reported outcomes (PROs)

An example of a generic PRO: EQ-5D

Please indicate which statements best describe your own health state today. Tick one box for each group of statements.

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

- I have no problems with performing my usual activities (e.g. work, study, housework, family or leisure activities) ☐
- I have some problems with performing my usual activities ☐
- I am unable to perform my usual activities ☑

Pain/Discomfort

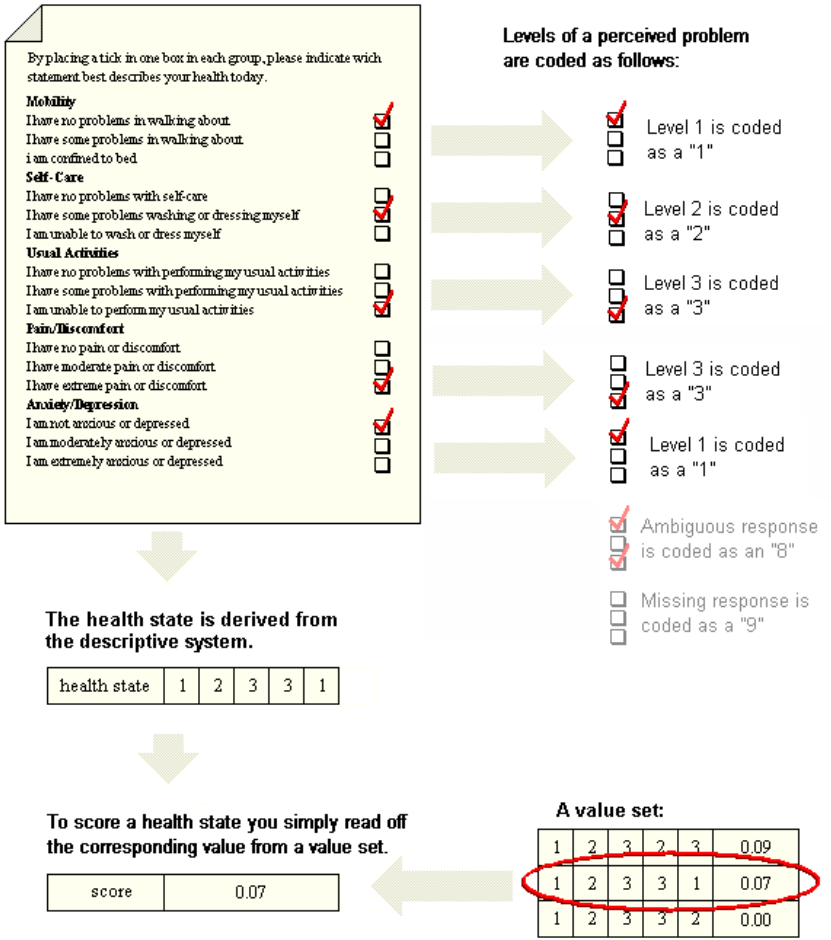
- I have no pain or discomfort ☐
- I have moderate pain or discomfort ☐
- I have extreme pain or discomfort ☑

Anxiety/Depression

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

Measuring quality of life using PROs

Measuring health on a generic health related quality of life instrument: the EQ-5D
www.euroqol.org/



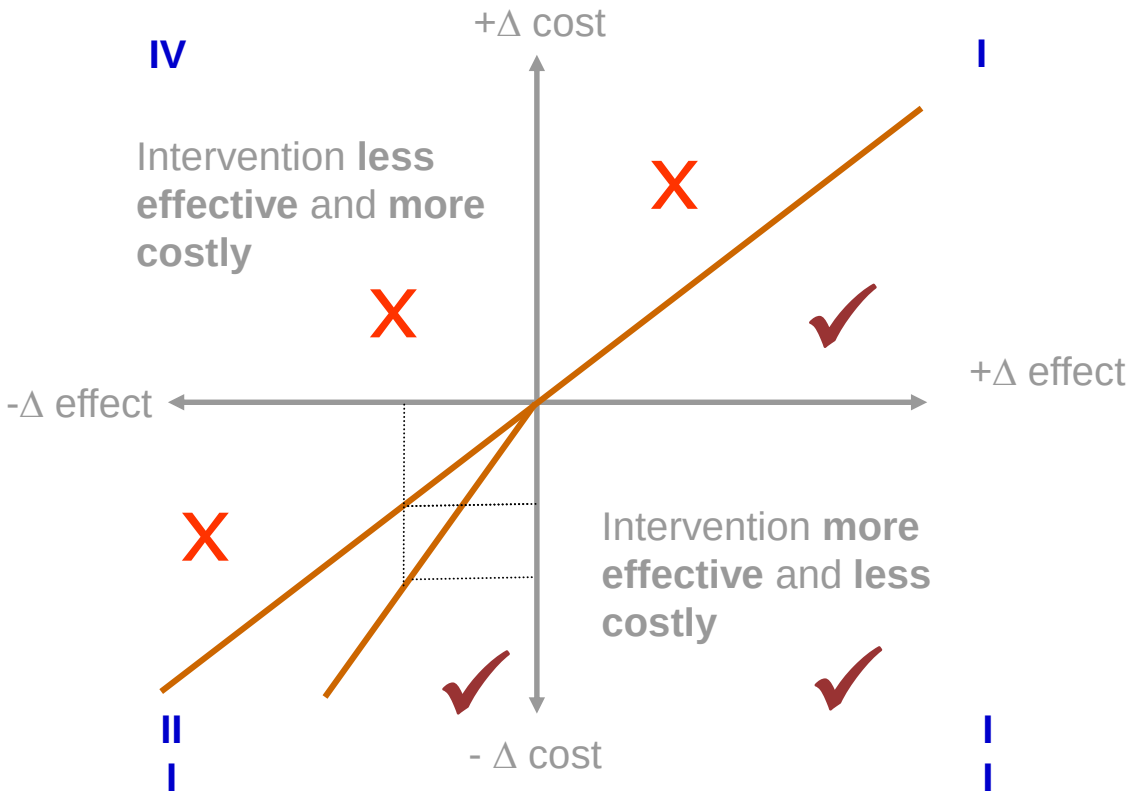
4. ICERS and decision rules

In contrast to CBA, there is no ‘absolute’ decision rule for ICERs.

To judge whether any given incremental cost per QALY gained (or incremental saving per QALY lost) is ‘worthwhile’, requires a ‘benchmark’ ‘cut-off point’ ICER

i.e “Cost effectiveness threshold”.
But what does it represent?
(a) Society’s willingness to pay to gain a QALY
(b) The opportunity cost of a QALY within the health care system
Lack of consensus on which is relevant; & how best to generate evidence on it.

Using ICERs used to judge value for money

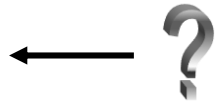


A stylised model of the opportunity cost-based "cost effectiveness threshold"

Cost per QALY of service 'at the margin' = threshold

Cost per weighted QALY gained	Health care service	Cumulative budget
£1	Service 1	£50,000
£1.50	Service 2	£80,000
$20k?		£100 billion
£30k?		
£800,000	Service 32,000	£800 000 billion

NICE's threshold is its 'best guess' about what this 'shadow price' is, given various (conflicting) evidence about that



5. The future of economic evaluation in health care

Going beyond QALYs, for example

- E-QALYs
- US value frameworks
- Value based pricing/assessment
- Impact Inventories
- MCDA

Distributional issues and equity

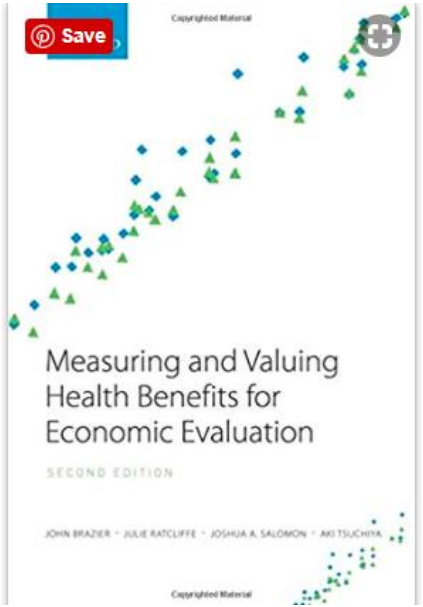
Uncertainty

Going beyond new technologies: disinvestment; budget impact; priority-setting frameworks

6. Recommended resources

Drummond et al (2015) Methods for the economic evaluation of health care programmes, 4th edition. Oxford Medical Publications.

Neumann at al (2016) (The 2nd Washington Panel) Cost effectiveness in health and medicine. Oxford



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SECTION

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Q&A Session