

# Health Economics

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# Content of presentation

- Definition of economic evaluation/ analysis
- Tools Used In Economic Analysis
- 5 types of economic analysis
- Role of economic evaluation in priority setting

# Why Economics for Healthcare?

- The scarcity of healthcare resources
- Alternative use of healthcare resources exist
- Increasing Demand for Value
- Increasing Demand for Accountability

# 1.a. Economic Definition.

- The Economics is the science that deals with the consequences of resources scarcity.
- The discipline of economics deals with use of scarce resources to satisfy human wants and needs how best to use the resources available.
- Economics is a social science that studies how individuals and organizations in society engage in
  - the production
  - distribution and
  - consumption of goods and services.

# Tools Used In Economic Analysis

1. Economic Variables:
  - Examples ( prices, costs, incomes, and quantities of commodities)
  - Can be measured along a scale.

# Types Of Economics

- a. Macroeconomics is the study of aggregate economic activities, such as:

## General price level

- We can measure that by some variables such as Inflation or Deflation Rate etc.
- Inflation is the annual rate of increase in a price index.
- Deflation is the annual rate of decrease in the price level.

# Types Of Economics

- B. Microeconomics the study of economic behavior of individual decision making units such as:
  - Consumers
  - resource owners and
  - business firms in a free –enterprise economy.
- We can measure that by some studies such as market , pilot and feasibility studies.

# Requirements of health services

## 1. Economy:

- We would like the services to be inexpensive.
- Somebody always pays either directly or indirectly.

## 2. Effectiveness:

- We expect the service to be effective we want each procedure to produce perceptible health gains {or reductions in suffering}.
- The evidence based medicine beginning to influence health care providers.

# Requirements of health services

## 3. Efficiency:

- We expect our services to be efficient. If we can deliver an equally effective service in different ways then we would want to choose the least expensive.

## 4. Value for money {VFM}:

- These three requirements, economy, effectiveness and efficiency, come under the heading of value for money {VFM}.

# Requirements of health services

5. Equity:
  - Three broad ways of defining equity in health care:
    - A. Equality of health status attained.
    - B. Equality of use of health care {for equal need}.
    - C. Equality of access to health care {for equal need}.
  - Horizontal equity the principal of equal treatment for equal need.
  - Vertical equity provision of unequal treatment for unequal need.

# Requirements of health services

## 6. Ethical issues:

- The behavior of doctors and other health care professional and may put them into conflict with those who manage resources.
- The doctor could manipulate the situation for financial gain.
- The patient is protected from these abuses by the doctor's ethical and professional codes of conduct.

# Economic Evaluation and Priority Setting

- Economic Approach of Level of spending
- Opportunity costs: the value of the next best alternative forgone (that is not chosen).
- Spending on health care is worthwhile as long as benefits are greater than opportunity costs
- Requires information on benefits of *all* possible uses of nation's resources!
- Improving public expenditure management essentially would essentially require cost-effectiveness analysis

# Decision problem we face in health care

The principles of economic evaluation

- Should a new drug or new surgical procedure be adopted or whether a particular medical procedure/health intervention worth undertaking?
- Should one form of treatment be expanded (while another is contracted)?
- After clinical effectiveness has been demonstrated, need to look to the balance of benefits and costs; identification and estimation of the health outcomes or benefits and costs of health care.
- A specialist hospital requests a license to establish a kidney transplant programme as claims it is cheaper than constant dialysis

# Measuring Health and Life

- Types of Health Measures:
  - Mortality: Death averted, Life years gained
  - Morbidity: prevalence and incidence
  - Disease Specific Measures: disease profile (chronic respiratory distress questionnaire)
  - Disease indices (Arthritis Impact Measurement Questionnaire- AIMS)
  - Generic health measures: Health Profiles (NHP), WHO Quality of Life(WHOQOL- low & middle income countries)
  - Health Indices: Non-preference based: SF-36, Preference Based: EQD5(international), HUI, QWB index

# QALY – Measure for Health Effects in CUA

- The method employs mobility, physical activity and social activity as criteria; another common method employs disability and distress as criteria
- Life expectancy is then multiplied by the quality of life rating to yield QALYs, i.e. adjusting the length of time affected through the health outcome by the utility value (on a scale of 0 to 1)
- QALYs- Other names Years of Healthy Life (YHL – US), Health Adjusted Person Years (HAPY) , Health Adjusted Life Expectancy (HALE)- Canada

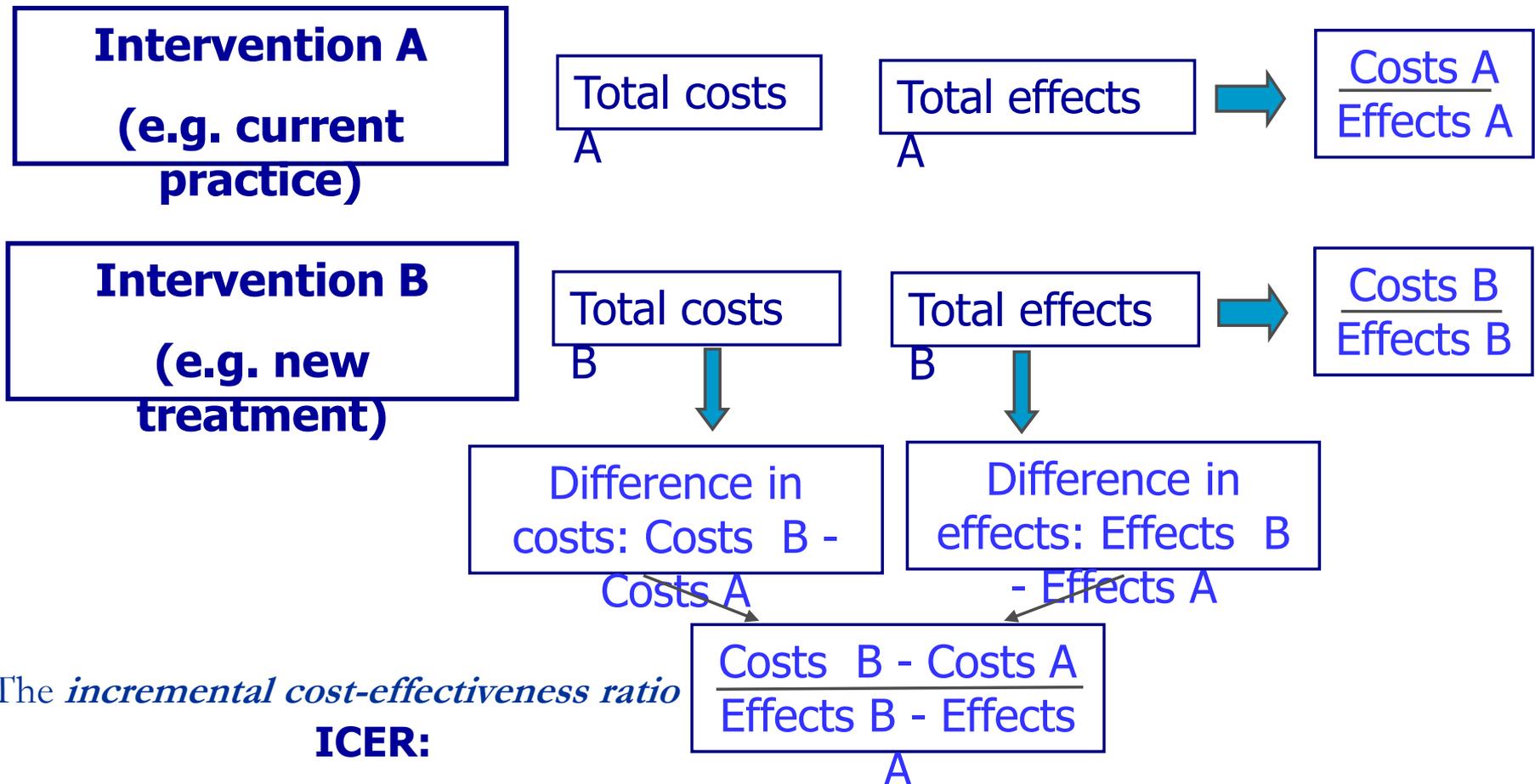
# What is Health Economics?

- Health economics is a theoretical framework to help healthcare professionals, healthcare decision makers, or governments, to make choices on how to make the best use of limited health resources decision

# What is Economic Evaluation?

- Systematic method to determine whether healthcare resources are spent efficiently
- Seeks to define a set of explicit criterion, so to facilitate the allocation decision of limited resource in different fields

# Economic evaluation



# Example 1

	Current practice	New medication	Difference [B-A]
Effects (average per patient)	25 life-years [Effect A]	25.5 life-years [Effect B]	+0.5

⇒ **New medication more effective so implement new medication..... but what about costs?**

⇒ **Healthy life years**, abbreviated as **HLY** and also called **disability-free life expectancy (DFLE)**, is defined as the number of years that a person is expected to continue to live in a healthy condition.

# Example

	<b>Current practice</b>	<b>New medication</b>	<b>Difference [B-A]</b>
<b>Costs</b> (average per patient)	£2000 <b>[Cost A]</b>	£4000 <b>[Cost B]</b>	+£2000
<b>Effects</b> (average per patient)	25 life-years <b>[Effect A]</b>	25.5 life-years <b>[Effect B]</b>	+0.5

⇒ ICER = £2,000/0.5 = £4,000 per life-year

⇒ It costs an additional £4,000 to obtain 1 additional life year

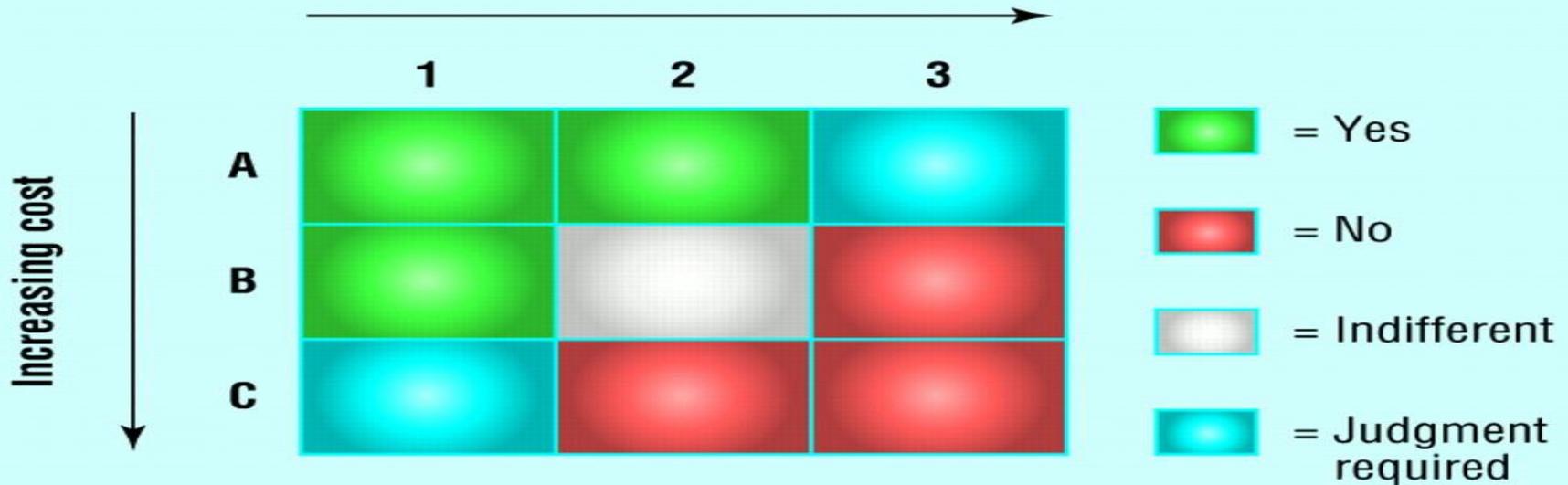
# Example -2

	<b>Current practice</b>	<b>New medication</b>	<b>Difference [B-A]</b>
<b>Costs</b> (average per patient)	£3000 <b>[Cost A]</b>	£2000 <b>[Cost B]</b>	-£1000
<b>Effects</b> (average per patient)	25 life-years <b>[Effect A]</b>	25.5 life-years <b>[Effect B]</b>	+0.5

⇒ New medication dominates

Relative to current care, should a new treatment be adopted, given evidence of:

**Declining effectiveness**



### **Effectiveness**

Compared with the control treatment the experimental treatment has:

1. Evidence of greater effectiveness
2. Evidence of no difference in effectiveness
3. Evidence of less effectiveness

### **Cost**

Compared with the control treatment the experimental treatment has:

- A. Evidence of cost savings
- B. Evidence of no difference in costs
- C. Evidence of greater costs

# Economic Evaluation and Efficiency

Each of the techniques is aimed at answering different questions: technical efficiency, allocative efficiency

- **Technical efficiency:**

- choice of *how* to provide health care
- minimize input for a given output

- **Allocative efficiency:**

- choice of *what* health care to provide
- maximize benefits subject to given resources

# Technical efficiency

- Producing a given level of output at a minimal cost or producing the maximum amount of output for a given cost
- Concerned with efficiency 'within' a programme

## Examples:

- When providing hernia repair surgery, is it best to provide conventional surgery or laparoscopic surgery?
- When providing rheumatology clinics, is it best to provide a nurse practitioner services or a consultant based service?

# Allocative efficiency

- Programmes compete for the allocation of scarce resources
- Comparison across programmes such as gynaecology, intensive care services, renal services, etc.

## Example:

- Should there be an expansion of surgery unit, rheumatology clinics or renal services?

# How to Conduct Economic Evaluation?

Two approaches:

1. Conducted alongside RCT (Randomized Controlled Trial) or non-randomised studies
  - Collect primary (new) data
2. Rely on existing (secondary) data or existing studies
  - Technology Assessment Reviews (TARs) for NICE

# 5 Types of Economic Evaluations

1. **Cost Minimization Analysis**
2. **Cost-Effectiveness Analysis**
3. **Cost-Utility Analysis(QALYs)**
4. **Cost-Benefit Analysis**
5. **Cost-Consequence Analysis**

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**Cost-minimization**

**Analysis**

# 1. Cost Minimization Analysis

- **What is the least costly way to get a given health outcome ?**

Rare (because effectiveness, utility and safety of interventions must be identical)

# Cost minimisation analysis (CMA)

- Not a full form of economic evaluation
- Know (or assume) health effects to be equal
- Both test A and B can detect 100 case of breast cancer in 10, 000 population, but test B is twice expensive as test A, so it is reasonable to adopt the test which has the least cost

## *Two possibilities*

1. Evidence suggests there is no difference in outcomes
  - But uncertainty surrounding the estimates
2. Prior view that health effects are equal
  - What is basis of this view?

# Cost-Minimization Analysis

## Examples:

- Screening of hereditary adenomatous polyps: genetic versus clinical test (Chikhaoui et al., 2002)
- Urea breath test for h.pylori: radioactive vs. non-radioactive versions
- Vaccine delivery by nurse practitioners vs. MDs

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Cost-effectiveness

Analysis

(CEA)

# Definition of: Cost-effectiveness Analysis (CEA)

- An economic evaluation in which the costs and consequences of alternative interventions are expressed cost per unit of health outcome.
- CEA is used to determine technical efficiency; i.e., comparison of costs and consequences of competing interventions for a given patient group within a given budget

# Cost- effectiveness analysis

- **Its aim is not just to use fund efficiently; a defined outcome must be realized as well**

# When Cost- effectiveness analysis?

- **When it is needed to evaluate alternative ways of reaching the same objective**

# Cost-Effectiveness Analysis

- Cost \$ / <natural unit>
- What does it cost to get a given health outcome:
  - To gain a year of life
  - To prevent a coronary bypass
  - To prevent a case of meningitis
  - etc.

# Cost- effectiveness analysis

- The method is very useful for the analysis of preventive health programs addressing different problems, and perhaps different target populations
- If several disease control programs are compared, it can be determined which one has the lowest cost per death averted

# Examples of Cost- effectiveness analysis

- **Number of lives saved**
- **Number of cases of blindness prevented**

# Cost-effectiveness analysis (CEA)

Effects are measured in terms of the most appropriate

*uni-dimensional natural unit*

- Cost per unit effect
- Most common type of analysis

Examples:

- Renal failure  $\Rightarrow$  cost per life saved
- Screening for Down's syndrome  $\Rightarrow$  cost per Down's syndrome foetus detected
- Location of Long-term care  $\Rightarrow$  cost per disability day avoided

# Cost Effectiveness Analysis

## ■ Example:

- Screening for breast cancer 50-69: \$5700/ life year gained (LYG)

# CEA limitations

- x Limitation : Narrow, uni-dimensional measure of effect (one indicator at a time in analysis)
  - Interventions often produce multiple outcomes

# CMA & CEA

- Concerned with technical efficiency
- “Given that it is decided that a goal/policy will be pursued, what is the best way of achieving it?”

OR

- “What is the best way of spending a given budget?”
- involves the comparison of at least two options

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Cost-utility

Analysis

(CUA)

# 3. Cost Utility Analysis

- Cost per quality-adjusted life year gained (QALY)

# Cost-utility analysis (CUA)

- Effects are multi-dimensional
- Combines life years gained with some judgment (or value or preferences) on the quality of those lifeyears
- Most popular measure:
  - quality adjusted life years (QALYs)
- Can address technical efficiency and allocative efficiency within the health care sector

# Cost Utility Analysis

- CUA is a special case of CEA where QALYs are employed as the measure of health status
- CUA uses cost per QALY as means of ranking alternatives
- Alternatives need not even be health care measures

# Cost Utility Analysis

- Maynard (1991) ranks seven courses of action by cost per QALY:

Home renal dialysis	£17300.	Heart transplant	£8000
Kidney transplant	£3500.	Heart bypass	£2000
Hip replacement	£1000.	Stroke prevention	£750
Anti smoking campaign	£250		

- Allan Williams (1985, converted in 1989-90 prices)

GP advice to stop smoking	£260	Hip replacement	£1140
CABG for severe angina LMD	£1590	Breast Cancer Screening	£5340
GP control of total serum cholesterol	£ 2600		
Hospital haemodialysis	£21500		

# Cost Utility Analysis

- CUA have important implications for allocation of resources
- CUA is still generally restricted to efficiency with which health service resources are used; tends to neglect costs borne by others (such as patients)
- CUA may be used to rank alternatives but it cannot say with certainty whether any option yields positive net benefits, this is because costs and benefits are measured in different terms

# Quality-adjusted life years (QALYs)

- Combine quality of a given health status and duration of time in this state
- Allows to account for mortality and morbidity
- Value given to various states from 0 (worst) to 1 (<healthy>)

# Limitations of CUA

- How do you value health states (0-1) ?
  - Discounting of future benefits
  - Ethical problems:
- 
- But.. Allows some comparison across different domains of health care

# QALY – Measure for Health Effects in CUA

- To assess the preferences for health states- individual need to be given information on symptoms, physical functioning, ability for work and social activity, and mental and social well being.
- The scores are based on people's preference

# Examples of cost/QALY

- Vaccination pneumonia 65+ cost saving
- GP advice to stop smoking \$500
- Kidney transplant \$ 6 000
- Coronary stent vs angioplasty \$ 28 000
- Lung transplantation \$ 125 000
- Beta interferon for multiple sclerosis \$ 700 000

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Cost-benefit

Analysis

(CBA)

# Definition of Cost-benefit Analysis (CBA):

- An economic evaluation in which all costs and consequences of a program are expressed in the same units, usually money. CBA is used to determine allocate efficiency; i.e., comparison of costs and benefits across programs serving different patient groups. Even if some items of resource or benefit cannot be measured in the common unit of account; i.e., money, they should not be excluded from the analysis.

# Cost- benefit analysis

- **Require a common measure of benefits (for example, \$)**
- **Then...evaluation is made in terms of the \$-benefits produced per each \$ of expenditure**

# Cost- benefit analysis

- **We obtain a benefit-cost ratio**
- **Those programs with a ratio exceeding 1 are worthy of consideration**
- **Those with highest ratios should be the priority to allocate funds**

# Direct and indirect costs estimation

- To measure the potential benefits if a disease is prevented, three elements (1) loss of production (2) expenditures for treatment (3) Pain discomfort. The number 3 is generally neglected due to lack of data/methods.
- Indirect cost are associated with the loss of output attributable to the disease due to premature death or disability.

# To Illustrate:

Program	Benefits	Costs	Ratio
Measles vaccination	\$110,000	\$10,000	11/1
Child and Maternal	\$210,000	\$35,000	6/1

# When Cost-benefit analysis?

- **When it is needed to compare/decide/evaluate on programs with diverse objectives**

# Cost Benefit Analysis

- Theoretically the most complete method, but in practice the most difficult and most criticized.
- Examples:
  - Pneumococcal vaccination
  - Reduction of smoking
  - Reduction of HIV and AIDS

# Cost Benefit Analysis

- Advantage: more global perspective
- Limitations
  - Focus on gaining productivity (human capital method)
  - Ethical problems with value of a human life
  - Requirements for data
  - Conflict: economic vs. public health perspective
    - ( i.e.: smoking & death at retirement)

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Cost-consequence  
Analysis

# Cost Consequence Analysis

- Given the numerous limitations of CUA and CBA, just present a table comparing the various outcomes & let the decision-maker weigh the options

Coast, BMJ, 2004

# Example: Home care vs. hospitalization

	Hospital	Home care
Health system cost \$/patient	\$ 2000	\$ 3200
Cost to patient & family \$/ patient	\$ 50	\$ 130
Mortality	6%	6%
Social activity score	-1.5	2.6
Physical function score	1.9	2.6
Patient & caregiver satisfaction	No difference	
Caregiver Burden	-3	-1

# Cost Consequence Analysis

- + :
  - global perspective
  - Decision-maker evaluates what is important
  - Avoids inadequate hypotheses
- -
  - burden of analysis for hurried decision-makers

# Summary

CMA	Technical efficiency	Effects (assumed to be) the same
CEA	Technical efficiency	Uni-dimensional outcome measure
CUA	Technical efficiency Allocative efficiency within health sector	Multi-dimensional outcome measure (health only)
CBA	Technical efficiency Allocative efficiency	Broadest outcome

Easiest



Difficult/  
challenging